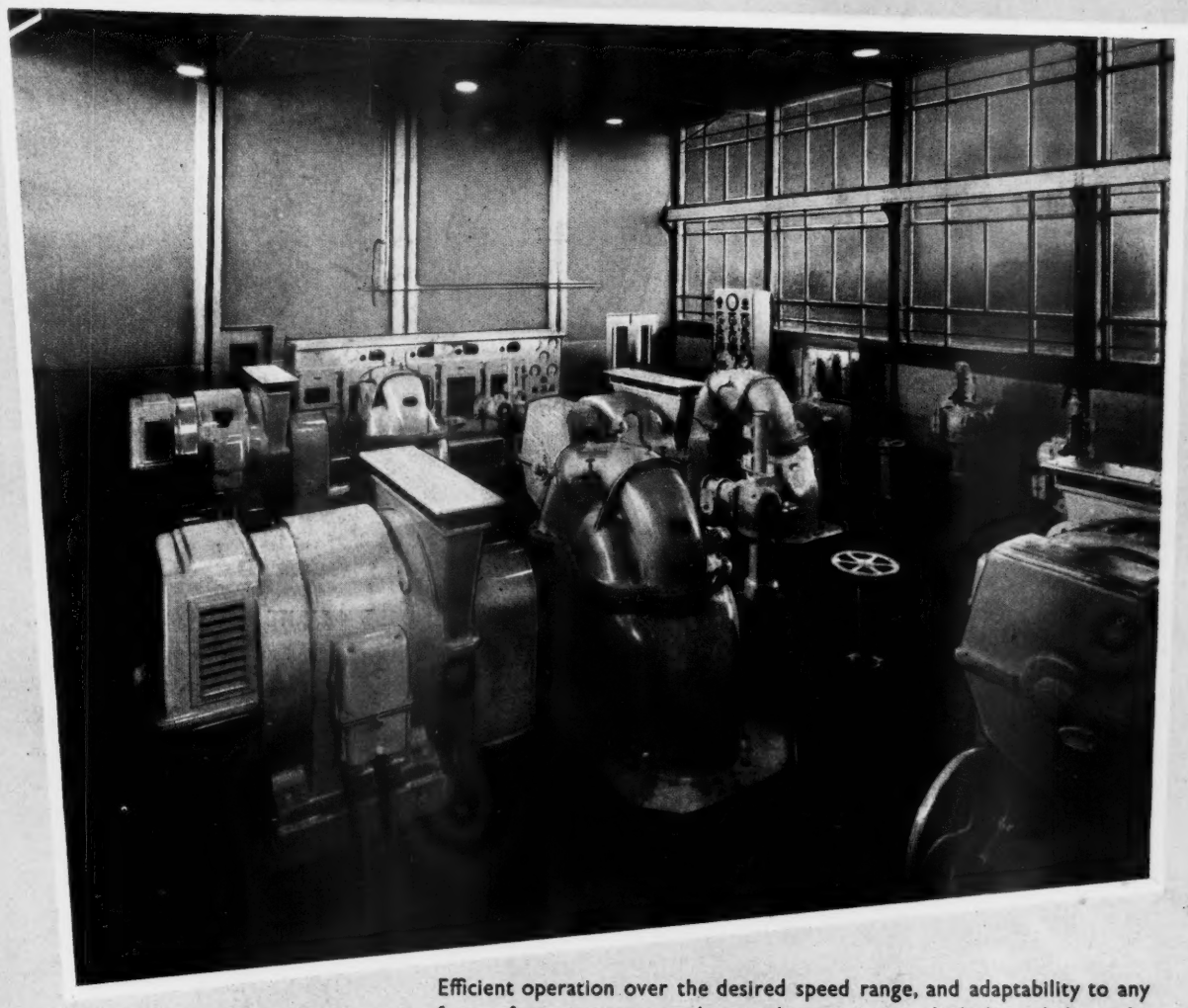
ELECTRICAL REVIEW

EASTER NUMBER
UNIVERSITY OF MICHIGAN
MAY 21 1957
ENGINEERING LIBRARY
PRICE 1s 6d

N-S VARIABLE SPEED A.C. MOTORS FOR PUMPING STATIONS



Four 320/60 h.p., 660/370 r.p.m., N-S variable speed a.c. motors, with L.S.E. control panels, driving Allen pumps at the Norton pumping station of Liverpool Corporation.
(*Corporation Water Works Engineer, Mr. J. H. T. Stilgoe, M.I.C.E., M.I.W.E.*)

Efficient operation over the desired speed range, and adaptability to any form of automatic control, are characteristics which have led to the adoption of N-S variable speed a.c. motors for pumping drives totalling tens of thousands of horse-power.

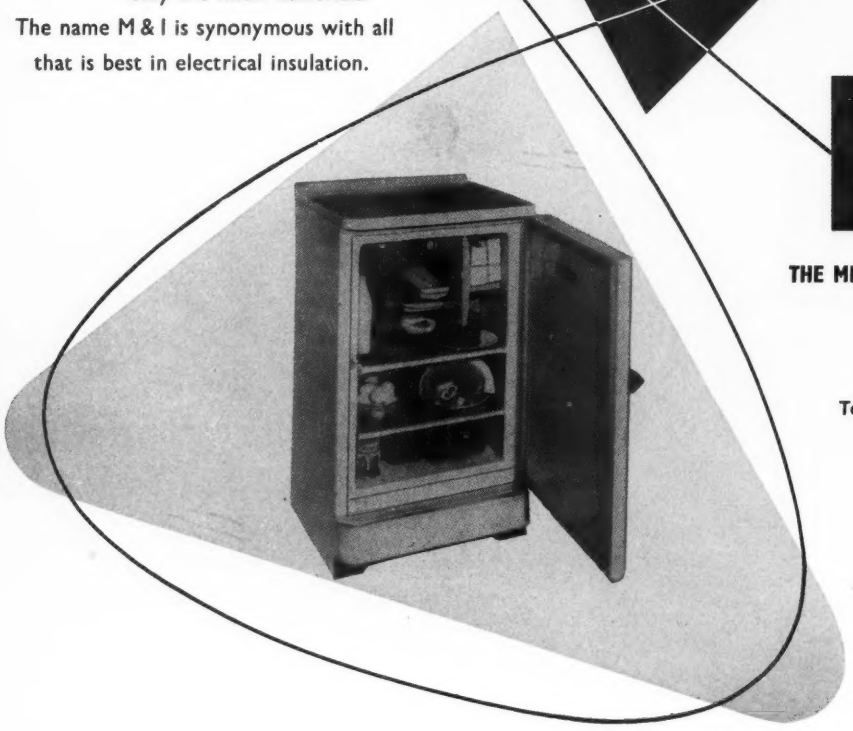
The N-S motor (1 - 2,500 h.p.) is serving the electricity, gas and water undertakings and almost every industry.

LAURENCE, SCOTT & ELECTROMOTORS LTD.
NORWICH MANCHESTER LONDON AND BRANCHES

UPPER PHOTOGRAPH by courtesy of Birlec Ltd.
LOWER PHOTOGRAPH Coldrator refrigerator by courtesy of The Hotpoint Electric Appliance Co. Ltd.

M & I PRODUCTS in hot spots and cold places

For safety and efficiency under all conditions it is essential to use only the finest materials. The name M & I is synonymous with all that is best in electrical insulation.



m and i

THE MICANITE & INSULATORS CO., LTD.,
Empire Works, Blackhorse Lane,
Walthamstow, London, E.17.
Telephone: Larkswood 5500.
Telegrams: Mytilite, Easphone, London.

MICA, MICANITE, "PAXOLIN", "PANILAX", EMPIRE VARNISHED INSULATION ON PAPER, CLOTH, SILK, NYLON, GLASS & TERYLENE BASE, SILICONE INSULATION, HIGH VOLTAGE BUSHINGS, FIBROUS MATERIALS, INJECTION MOULDINGS & EXTRUSIONS IN PVC AND OTHER THERMOPLASTICS

3 MAY
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Export Trade	797	Message from Mr. F. J. Erroll, M.P., Parliamentary Secretary to the Board of Trade
Electrical Export Prospects	799	The Export Director of the B.E.A.M.A. deals with some factors which are likely to influence the course of our overseas trade
Insuring Against Export Loss	800	Notes on the services available to British firms from the Export Credits Guarantee Department
World Electrical Imports	802	A survey of overseas trade with a map showing the proportions taken by the leading world suppliers
Electrical Export Achievements	803	An illustrated review of some of the contracts carried out by British electrical manufacturers in the past year or so
Overseas Electrical Trade	820	In the first quarter of the year Britain's electrical exports amounted to £56·6 million, an increase of £3·7 million compared with January–March, 1956
British Industries Fair	822	Electrical exhibits at Castle Bromwich
Domestic Electrical Equipment — Dry Shavers	836	Illustrated survey of the range of models now on the market

✧ ✧ ✧ ✧

Work Starts at Ffestiniog	811	**Generation and Development**	835
Letters to the Editor	812	**New Electrical Equipment**	839
Views on the News	813	**Financial Section**	840
Personal and Social	814	**New Patents**	844
E.R.A. Report	817	**Contract Information**	845
Transmission in Russia	819	**Next Week's Events**	846
Industrial News	828		
Submarine Cables at 138 kV	831	*CLASSIFIED ADVERTISEMENTS*	145
Instruments and Automation	833	*INDEX TO ADVERTISERS*	158

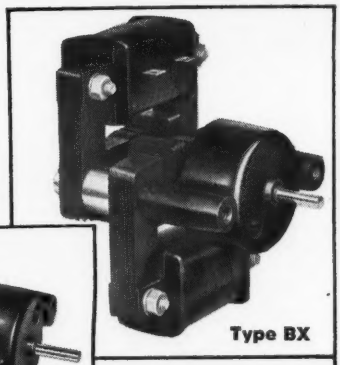
VOLUME 160 NUMBER 18 ✧ *Eighty-Fifth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £4 10s 0d: U.S.A. and Canada $14.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

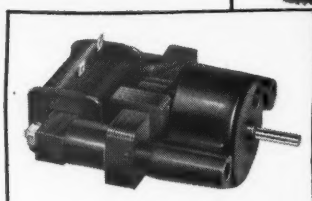
'SYNCLOCK' ELECTRIC MOTORS

RANGE EXTENDED TO SEVEN BASIC TYPES

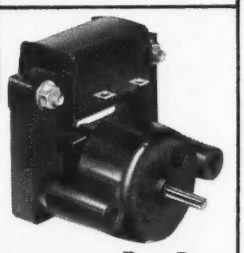
The "Synclock" Synchronous Motor is of the hysteresis type, is self-starting and has a predetermined direction of rotation. Used as the power drive for all forms of time mechanisms and in instrument and process control equipment, it is available in light or heavy duty types, specially high torque models and reversible types. All are described in a new brochure (Sheet 600A) giving full technical data and dimensions. Please write for a copy.



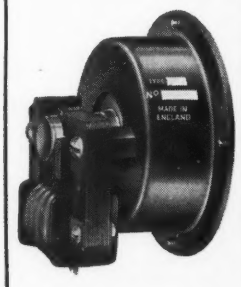
Type BX



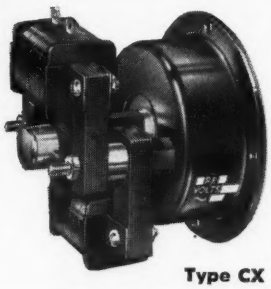
Type BE



Type B



Type C



Type CX

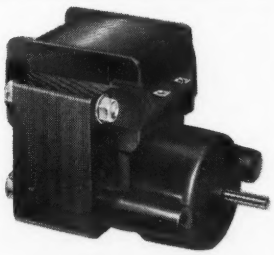
Some applications of ELECTRIC SYNCLOCK MOTORS

Time Interval Meters

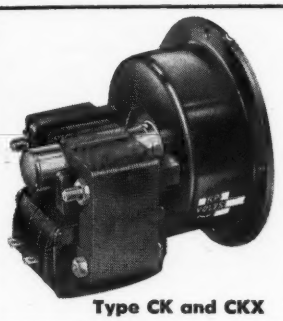
The majority of "Synclock" Motors are available for immediate delivery.

- Air Conditioning Control
- Aircraft Flight Simulators
- Advertising Devices
- Cam-Operated Timing Devices
- Cycle Controllers
- Echo Sounders
- Electric Clocks
- Flow Control
- Graphic Recorders — all types
- Oil Burner Controls
- Process Timers
- Programme Controllers
- Railway Signalling
- Revolution Counters
- Stoker Control
- Time Clocks
- Time Delay Relays
- Time Stamps
- Time Switches
- Traffic Signals
- Voltage Regulators
- Vulcanising Timers
- Watch Testing
- X-Ray Apparatus

Process Timer



Type BK and BKX



Type CK and CKX

EVERETT EDGCUMBE SYNCHRONOUS MOTORS

EVERETT EDGCUMBE & CO LTD COLINDALE WORKS, LONDON, N.W.9 *Telephone: Colindale 6045*
LONDON OFFICE: COLUMBIA HOUSE • ALDWYCH W.C.2 • Telephone: Chancery 5953/4
DBH/3095

ELECTRICAL REVIEW

3 May 1957 Vol. 160 No. 18

MESSAGE FROM MR. F. J. ERROLL, M.P.

PARLIAMENTARY SECRETARY TO THE BOARD OF TRADE

THE CONTRIBUTION being made to United Kingdom exports by the electrical industry is impressive; in 1956 its large range of products added no less than £273 million to our earnings from overseas trade. This is a tremendous performance, and it might be thought that no further exhortation to this industry was necessary. But it is in this field (which embraces nuclear power) that the greatest opportunities for further progress exist. The world demand for electricity increases by about 7 per cent every year; this offers an enormous field to United Kingdom manufacturers, who are second to none in ability to produce the electrical plant and appliances which will be required. We must, therefore, look to the electrical industry to make continued efforts to increase its share of the world markets for its products.

In this task, anything which can assist British electrical manufacturers by showing their potential customers something of the industry's achievement is to be welcomed, and I would like, therefore, to commend this special export issue of the Electrical Review.

At the same time, I would like to take this opportunity of reminding exporters of the services offered by the Government, both at home and abroad, to assist them in developing overseas trade. At the Board of Trade headquarters in London, and at any of its regional offices, information and advice are obtainable on their export problems, and their inquiries can be referred to the man-on-the-spot overseas.

The Commercial and Consular Officers of the Foreign Service, and the Trade Commissioners in the Commonwealth, maintain close relations with business and commercial communities in their territories and are able to offer assistance to British exporters in developing their overseas trade. These officers feed back information to London concerning overseas markets, provide information and advice in response to individual inquiries, give help in the selection of agents and assist exporters in many other ways. Exporting firms can avail themselves of the services of Trade Officers overseas, either by getting in touch with them direct or by applying to the Export Services Branch of the Board of Trade.

F. J. Erroll

LONG-TERM CREDITS

Suppliers of capital goods and heavy electrical plant will be perturbed by the Government of India's recent decision to grant import licences for such goods only if suitable terms of deferred payments are arranged by the importers concerned. Two alternative sets of "suitable terms" are laid down: the first provides for the payment of not more than 20 per cent before shipment, the remainder to be paid in seven annual instalments; the other limits the initial payment to 10 per cent, the balance to be paid after production has started "and in instalments which should not exceed the net saving in or earning of foreign exchange which the project will achieve thereafter."

The *Board of Trade Journal* in reporting the arrangements gives particulars of cases in which deferred payment will not be insisted on. Such cases include imported plant and equipment less than Rs.5 lakhs (£37,500) in value, equipment for replacement and maintenance purposes and contractors' plant.

Such lengthy credit terms are very unusual and it seems possible that the Indian Government has been encouraged to take this course by the willingness of the Russians to offer such terms in connection with their supply of heavy plant.

TRADE WITH CHINA

For a long time British manufacturers and exporters have chafed at the rules which prevent them from supplying to the Chinese People's Republic equipment which is officially described as "strategic." They have asked that at least they should be permitted to supply the types of goods which may be sent to Russia, which is also under strategic limitations. The British Government has sympathised with this point of view and, it seems, has now persuaded the United States, which has been very rigidly against any relaxation, that it is in its allies' best interests that their trade with China should be increased.

It seems that this unbending has been prompted mainly by the need for Japan to open up the Chinese market and so any easing of the rules will be accompanied by eager Japanese competition in some lines. However that may be, British electrical manufacturers, among others, will welcome the opportunity to gain a bigger share of what must eventually be one of the world's most important markets.

THE B.I.F.

Although it has no officially-sponsored electrical section this year, the electrical glory has not quite departed from the British Industries Fair, now confined to Castle Bromwich, Birmingham. It is true that none of the big electrical four (or five) is now taking part but a number of large concerns are still present and there are many other firms with electrical exhibits of various kinds.

In fact the Fair is still a going concern under the able management of Mr. H. O. Missenden and the sponsorship of the Birmingham Chamber of Commerce. As our readers know, the attitude of the electrical industry to the Fair has been influenced by several considerations, not the least being the latter-day availability of the Electrical Engineers' Exhibition which seems to meet their needs more satisfactorily than the B.I.F. has done in recent times. After supporting the Fair for so many years we naturally feel some regret that the great electrical industry is now inadequately represented but we fully realise that the exhibitors pay the piper and if they do not get the tune they call for look around for a new instrumentalist.

NUCLEAR STATION AUXILIARIES

Since the entry of nuclear energy into the electricity generation field we have heard questions asked about the repercussions on the manufacture, installation and operation of various types of power station auxiliary equipments. The general answer seems to be that all the while nuclear energy in power stations is used only as a heat source for the generation of steam to operate the conventional type of steam turbine it is unlikely that there will be any change in the techniques of the steam auxiliaries. To test this assumption we asked for the views of a leading manufacturer of condensing plant and have received a reply in the following terms:—

In the generation of electricity from nuclear energy the turbo-alternators are still of the conventional type and consequently there has been no basic change in the manufacture, installation or operation of condensing plant. So far, steam generation by nuclear power has taken place at the comparatively low working pressure of 250 lb/sq in, with the result that for a given rating of turbine the condensing plant is much larger than for a turbine of the same size working at pressures of 900 or 1,500 lb/sq in; but this presents no radical changes from conventional design. No doubt time will bring about gradual increases in steam pressures for nuclear energy stations, even up to the critical or super-critical pressures, but so long as conventional steam turbines are used there will be no change in condensing plant technique.

UNDERWATER TRANSMISSION

The transmission of 120 MW at 138 kV from British Columbia to Vancouver Island formed the subject of a paper presented before the Supply Section of the Institution of Electrical Engineers, which is reported in this issue. This scheme, some preliminary particulars of which were published by us on 28th September last, marks a major achievement in submarine cable development. Nearly eight months of virtually trouble-free service should be enough to demonstrate the soundness of the design, notably in eliminating joints at sea.

Possibly the scheme will represent the high-water mark of a.c. submarine transmission at so high a voltage and so long a distance in view of progress anticipated in a.c./d.c. conversion equipment. A later change of system to d.c. would no doubt be feasible to give increased current carrying capacity but it would not offer the same advantage as would a d.c. link between England and France in avoiding complications of power exchange between two large frequency-tied electrical networks.

ELECTRICAL EXPORT PROSPECTS

BRITISH MANUFACTURERS READY TO MEET ALL DEMANDS

By D. MAXWELL BUIST, M.I.E.E., M.I.Ex.

THE way in which an industry views its own future is a sure indication of confidence in its own capacity and competence, and most electrical manufacturers will echo Lord Chandos when he estimated that the electrical industry will nearly double in size in the next ten years. A timid outlook seldom results in expanding production and new enterprise; the present vigour and buoyant optimism of British electrical manufacturers are the true hallmarks of dynamic business concerns.

This is not said in any mood of complacency, for there is certainly no inevitability about the growth of our British industry. There are too many competitors around for that. It is only from the continued improvement of our products, through technical innovation and by the most appropriate managerial techniques, that these large assumptions will be realised. And none of these can be effected without much hard work and risk taking. This has always been so in our industry, as the files of the *Electrical Review* of two decades or more ago will demonstrate.

Nation's Dependence on Engineering Exports

It is a commonplace now that the prospects of expanding the United Kingdom's exports depend largely upon the engineering industries of the country. Over a very long period coal and cotton goods were the staple of our foreign trade, but since the war they have accounted for only a diminishing proportion. Engineering exports on the other hand increased to a figure of £1,270 million in 1956, 40 per cent of the grand total of U.K. exports and nearly one half of the total of manufactured goods only.

Mr. Buist is Export Director of the British Electrical & Allied Manufacturers' Association

But what is not always realised is that electrical products made up as much as 21 per cent of this engineering total. In 1956 the value of electrical exports, amounting to £272·5 million, was about 8·6 per cent of all U.K. exports during that year.

And when one considers the many kinds of products included in the total—for example, there are 162 separate headings covering electrical apparatus and equipment in the Export List of H.M. Customs and Excise; the multitude of skills and abilities concerned in their production; the initiative and vigour that went into the sales efforts; and the varying complexities of organisation, one cannot help but make the claim that of the many exporting industries of the country our electrical industry holds pride of place.

Progress of Electrical Exports

During the past ten years the value of electrical plant and equipment exported from this country has risen from £85 million in 1947 to £273 million in 1956 and the extent of recent progress can be measured by the fact that last year's total was one-quarter above the 1954 figure.

The 1956 record effort is twelve times the pre-war figure, when the U.K. led the world in electrical exports with a total of £23 million. It may be calculated that, having regard to changed price levels, electrical exports on a tonnage-output basis have increased to four times what they were before the war. It should not be overlooked also that a very substantial amount of electrical equipment is embodied in other engineering exports.

Our industry's exports now amount to something like 23 per cent of the industry's total production for home and export markets. This proportion is lower than in many previous years and reflects the enormous increase in demand at home for conventional power plant, nuclear power plant, railway electrification equipment and for machinery for coal and steel production.

Competition from Other Countries

However, absolute increases in exports do not of course tell the whole story. Estimates of the total of world exports of electrical goods show that Britain's share of the export trade available over the globe has fallen gradually from 28·1 per cent in 1952 to 25 per cent in 1956, whereas Western Germany has increased her share from 11·5 per cent to 19·3 per cent over the same period. Although our exports have risen, the increase has not kept up with the expansion in the trade open to the industry. Our other principal competitor, the United States, took 31·2 per cent of the world total in 1952 and 31·6 per cent in 1956.

Although it may be argued that the conditions for further expansion of German electrical exports at the same rate as in recent years will not remain so favourable as they have been, we should never under-estimate the competitive ability of this vigorous nation. We can be sure that Germany will not slacken her efforts in foreign markets, and neither will the United States. And these facts, the growing industrialisation of the under-developed countries, and the rising outputs of electrical equipment all over the world mean that British electrical products must keep ahead. For this reason, scientific research and development is receiving ever growing attention.

Nuclear Power Programme

Research in the field of nuclear energy is possibly the most exhilarating and enlivening occupation in the industry at the present time. In fact, events are moving so fast in this field that it is difficult to write about the subject without being out of date before the article appears in print. Only six months has elapsed since Her Majesty the Queen opened the first of the four reactors being built at Calder Hall, but already nuclear power has become recognised as the source which will in the future satisfy the major part of Britain's growing power requirements.

Nuclear engineering has brought together many different firms with experience in electrical engineering, mechanical engineering, civil engineering, chemical engineering and electronics, and this wide range of skills is reflected in the organisations which can now undertake the building of nuclear power stations. The British

Government's recent announcement of the trebling of the amount of nuclear power plant planned for installation by 1965 is an impressive tribute to the technological progress made by the British engineers, scientists and manufacturers concerned.

Yet at the same time probable overseas requirements are being taken into account, for the expanded programme is being kept as flexible as possible. British firms are confident of being able to fulfil a high level of exports of nuclear power stations, research reactors, and nuclear industrial plants of all kinds.

Economic Policies

But if we are to maintain or improve our position something will have to be done to ease the burdens which British industry has borne for so long. Government expenditure, with its accompanying penal taxation, will have to be reduced and the slight attempts made in this direction are more than welcome. Purchase tax is a serious handicap—coupled with other measures to curb domestic expenditure it has severely affected the size of total production upon which our competitive position in the export markets depends.

The raising of import tariffs and the narrowing of British preference margins by some of the Dominions are also causing anxiety to British electrical manufacturers. Even worse are the quantitative restrictions which have been imposed by some Commonwealth countries. These are matters to which the United Kingdom Government should give serious attention.

Another subject for Government action is the state of the trade with China. It is satisfactory to see that there are now afoot suggestions for revising the list of embargoed goods, although it does not seem that the revision will go far enough. In the meantime, countries not parties to the agreement restricting Chinese trade are gaining a hold on this extremely promising market.

Without doubt, the one aspect of foreign trade which is receiving the greatest amount of thought and discussion is the European Free Trade Area plan. The British Government has put this forward as a means of association with the European Common Market now in process of ratification, on the ground that it would be detrimental to the country's trade to be completely outside the Common Market. Many British industrialists question this assumption. At the present time it is true that much more electrical equipment is being exported to Continental countries than imported from them, but the opening of our home market to European manufacturers would seriously prejudice the position of many British firms in this country. It is also thought that the ultimate effect of the plan might be to strengthen the position of European competitors in some of our overseas markets—particularly those in the Commonwealth.

On the other hand, the size and rate of growth of the market for electrical goods on the Continent compares so favourably with markets in other parts of the world that many electrical firms would be reluctant not to make the most of the opportunity afforded in the Government's plan. The restrictions of some Commonwealth countries referred to earlier have played some part in this attitude.

But it seems fairly clear that if an association with the European Common Market comes into being on the lines at present proposed, considerable changes in outlook and organisation will be required of British manufacturers. Even in the sphere of education, for example, more emphasis on proficiency in foreign languages will be necessary in the training of electrical engineers. Or, it might prove mutually advantageous to explore the possibilities of co-operation with Continental manufacturers on matters of common interest, as do members of trade associations in this country.

British electrical manufacturers are insisting that much more discussion and negotiation is necessary before this country is finally committed to the scheme. For this purpose a great deal of statistical analysis must first be done—work which the B.E.A.M.A. has embarked upon.

Whatever the final outcome of negotiations may be, the country's electrical export trade has to be carried on and the electrical manufacturers, although embarrassed by fiscal and political interference, will see that it is. Their ability to serve the country and the world has been abundantly demonstrated by their constantly-increasing production and export trade.

INSURING AGAINST EXPORT LOSS

HELP FROM THE EXPORT CREDITS GUARANTEE DEPARTMENT

By **Philip Jones**

A FIRM making radio receivers and other electrical equipment some years ago had over £100,000 outstanding on credit sales to one foreign market: although the buyers were ready to make payment, exchange controls prevented the transfer of sterling to the United Kingdom. Fortunately the company was insured with the Export Credits Guarantee Department, which paid a claim on this one market alone of over £100,000. This case illustrates neatly both the substantial hazards involved in export trading, and the protection against these hazards provided by E.C.G.D.

But the usefulness of E.C.G.D. cover does not stop at "protection." Because of this protection the exporter can venture more confidently into new export markets, and can make larger shipments to new buyers than he might make at his own risk. Bank reports that a buyer is "good for" a particular figure perform a most useful function, but however much the exporter relies on reports the risk remains his own unless insured, and with it there is a tendency to limit outstanding amounts for a new buyer severely, until confidence has been built up.

In two years, for example, the company mentioned above built up its business with one export market from £3,500 to £15,500 and with another from £150,000 to £270,000. Because of this facility for buoyant expansion and rapid exploitation of business openings E.C.G.D. has been associated with many outstandingly successful exporters. In seven years the above company raised its gross annual export turnover from £120,000 to £2,225,000, paying insurance premiums at a rate of roughly ½ per cent. Another company manufacturing heaters exported £7,000 per year before insuring with E.C.G.D. Within seven years it was exporting £112,000 per year and paying a premium of under £400 per annum.

There is no recognised "size" for an E.C.G.D. policyholder; some of the largest companies in the electrical industry insure multi-million pound capital projects and some policy holders may be doing only a few hundred

pounds' worth of export business when first they insure.

Let us examine just what protection is given by this insurance. In the first place, the buyer may become insolvent, or he may simply fail to pay when payment is due. Again, the goods may be prevented from reaching him because export licensing is imposed in the United Kingdom or import licensing in the buyer's country. Or war or civil disturbance may prevent the goods from reaching him. Or after he has received the goods and is prepared to pay for them, exchange difficulties may prevent his payment from reaching the exporter.

Extent of Cover

Against all these risks E.C.G.D. provides cover, to the extent of 85, 90 or 95 per cent of the total loss, according to the class of event causing the loss—and with some special limitations (including a " first loss " of 20 per cent) in the case of the buyer's default on contract *before* he has accepted the goods, i.e., whilst the goods are still under the control of the seller. These are the risks against which E.C.G.D.'s basic policies provide cover: they include all the major causes which can prevent the exporter from receiving prompt payment.

In the case of large capital projects where credit is given in excess of two years, individual cover is arranged for each contract whilst it is in process of negotiation with the buyer.

As regards all other business, where the credit period does not exceed six months—which can be extended by endorsement to two years—the exporter offers the whole of his business for twelve months ahead at predetermined premium rates varying according to the market concerned and the terms of credit offered. In certain cases an exporter can insure his business with a particular group of markets, provided that these give E.C.G.D. an acceptable " spread." It is not possible under this form of cover to insure individual transactions, or business in individual markets: the exporter insures the good (at relatively low premiums) along with the bad (at relatively high premiums). But, overall, the level of premiums reflects the economies and stability which E.C.G.D. achieves through " spread of business."

Exporters of electrical products will appreciate how decisive an influence on sales the delivery period factor can often be. For every buyer who contracts far enough ahead for the majority of competing suppliers to meet his date, there are many who would rather retain flexibility in the face of changing conditions by placing orders later. Such buyers know that by deferring their buying they may eliminate many suppliers and thus find themselves forced to buy in a premium market: experience has shown, however, that this is no deterrent.

The exporter who can sell on the shortest delivery dates can, therefore, expect additional business, and often at favourable prices. For the manufacturer of " one-off jobs " the problem is strictly one of designing, manufacturing and delivering the goods in the shortest possible time, but for the manufacturer of " standard lines " there is another way. Delivery time from date of order can be cut by manufacturing into stock in advance of firm orders.

Stockholding in an overseas country can also help and provide a cushion between fluctuating levels of sales and the stable volume of production which is of course desirable both from the point of view of costs and labour relations. As long as stocks remain unsold they do unfortunately tie up investment—often they represent a potential loss. No one can advise a manufacturer on what should be the prudent level of stocks at any time: clearly he must form his own estimate of future sales from stock and balance this against the other factors of his business.

Without insurance cover, the exporter may well feel that he should keep stocks—and the attendant risks—under control by holding stocks in the United Kingdom. But the United Kingdom is not necessarily the best place to sell from and the advantage of quick delivery is lost. But there are undoubted risks where goods are in stock overseas.

E.C.G.D. covers the goods while they are in transit against loss through war, revolution, etc., not covered by marine insurance, and against additional handling charges incurred through diversion on voyage. After the arrival of the stock in the overseas territory and before it is sold (i.e. while it is lying in stock) E.C.G.D. insurance covers against the risk of war, civil disturbance, and requisition or confiscation of goods for a period of six months (or, at the exporter's choice, for a shorter period at a lower premium). This period may be extended at underwriters' discretion, for one further period of six months (or like period if less than six months was originally covered) on payment of any additional premium.

Sales from stock are covered from the date of sale, on the same basis as sales direct from the United Kingdom. If the goods held in stock are not sold and the exporter decides to return the stock to the United Kingdom or alternatively decides to ship them to another overseas market either during or at the end of the period of cover, he is covered against loss should an action of the overseas government prevent him from doing so (provided that at the time of the original import he had obtained any necessary authority to re-export the goods).

A feature of special importance in the stockholding cover is that if, in exceptional circumstances, E.C.G.D. should find it necessary to suspend cover on all future contracts with and shipments to any particular market, goods already held in stock in that overseas country remain covered for a period of six months from the date of suspension (or, in the case of stocks in transit, six months from the landing). This provides the exporter with six clear months in which to sell off the stock under full E.C.G.D. cover. The value of this provision has been proved in the recent Middle East disturbances.

Overseas Subsidiaries

An alternative method of exporting is by selling to subsidiary companies established by the exporter in overseas markets. Such a plan is generally only embarked upon where a substantial market for the product is known to exist, since it may involve substantial capital outlay.

In such cases a subsidiary will provide a useful " distributor " whose stock inventories can be controlled by the exporter (the parent company) in the light of first-hand knowledge of the local market, and on the production plans and world-wide sale outlook of the parent company. An important argument in many markets for the setting up of a subsidiary company is the legal, fiscal and psychological advantages which may result. E.C.G.D.'s normal cover can generally be adapted to embrace any such subsidiary arrangement. Sales to the subsidiary can be covered against all the normal risks except the insolvency of, or a protracted delay in payment by, the subsidiary and the sales effected by the subsidiary can in turn be insured against all normal risks covered by E.C.G.D.

The Department maintains branches in London (City and West End), Belfast, Birmingham, Bradford, Bristol, Edinburgh, Glasgow, Leeds, Liverpool, Manchester, Newcastle-upon-Tyne, Nottingham and Sheffield from which fuller information about its guarantees can be obtained.

World Electrical Imports

POSITION OF THE PRINCIPAL SUPPLIERS

THE world map in which we have indicated the import trade of the leading countries, showing the proportions of various suppliers, is based upon figures published by O.E.E.C. and the individual countries. As the time of publication of annual comparable trade accounts varies considerably country by country the survey covers the electrical trade in world markets during 1955.

The year under review was marked by increased competition in world markets, not only among European suppliers, but also between them and other traditional exporters of electrical products, mainly the United States and Japan, and recently Eastern Bloc countries. Competition with the United States is very strong in some parts of the world, especially in South America, but the fact that European electrical manufacturers have been able to increase their exports to the United States points to improved competitive power, particularly in products in which the labour content predominates.

TABLE 1.—U.K. ELECTRICAL TRADE WITH THE MESSINA COUNTRIES, 1955 (£ million)

Countries	Exports to	Imports from
Belgium and Luxembourg	3·2	0·3
France	3·1	0·8
Italy	2·9	0·3
Holland	6·8	6·0
W. Germany	2·1	4·5

The products offered by Japan and the Eastern Bloc may sometimes be of lower quality, but in general their prices are considerably lower than those of Western products; moreover, the Eastern Bloc countries are offering long-term credit concessions with low interest rates, promises of speedy deliveries, and exchange of technical personnel.

Fluctuations in the economic situation in important markets of the electrical industry have obviously exerted a major influence on the trend of exports and the value of exports to certain areas has varied to a considerable extent in recent years. The fluctuations have been intensified by import restrictions which certain markets have introduced as a consequence of their balance of payments difficulties.

The accompanying multi-coloured chart shows the individual electrical imports of fifty countries, valued in £ million. The value of each market is represented by circles and the shares of the four most important supplying countries by corresponding sectors. Exceptions are markets like Bolivia, Brazil, Colombia, Ecuador and Mexico where the United Kingdom's share of exports, being small, is shown separately.

When analysing the world markets in order of their importance, Canada ranks first with imports valued at £98 million, followed by Holland (£49·1 million) and Australia (£28·8 million). During 1955 87 per cent of Canada's needs was supplied by the United States, the United Kingdom's share being about one-tenth. In common with most European markets, West Germany supplied the bulk of Holland's imports, this being her main market, with the United Kingdom taking third place, after Belgium. The principal items supplied by Holland are electronic products; about 48 per cent of Holland's total production is exported. Australia, the world's third largest market, imported about 75 per cent from the United Kingdom, with the United States and West Germany following up.

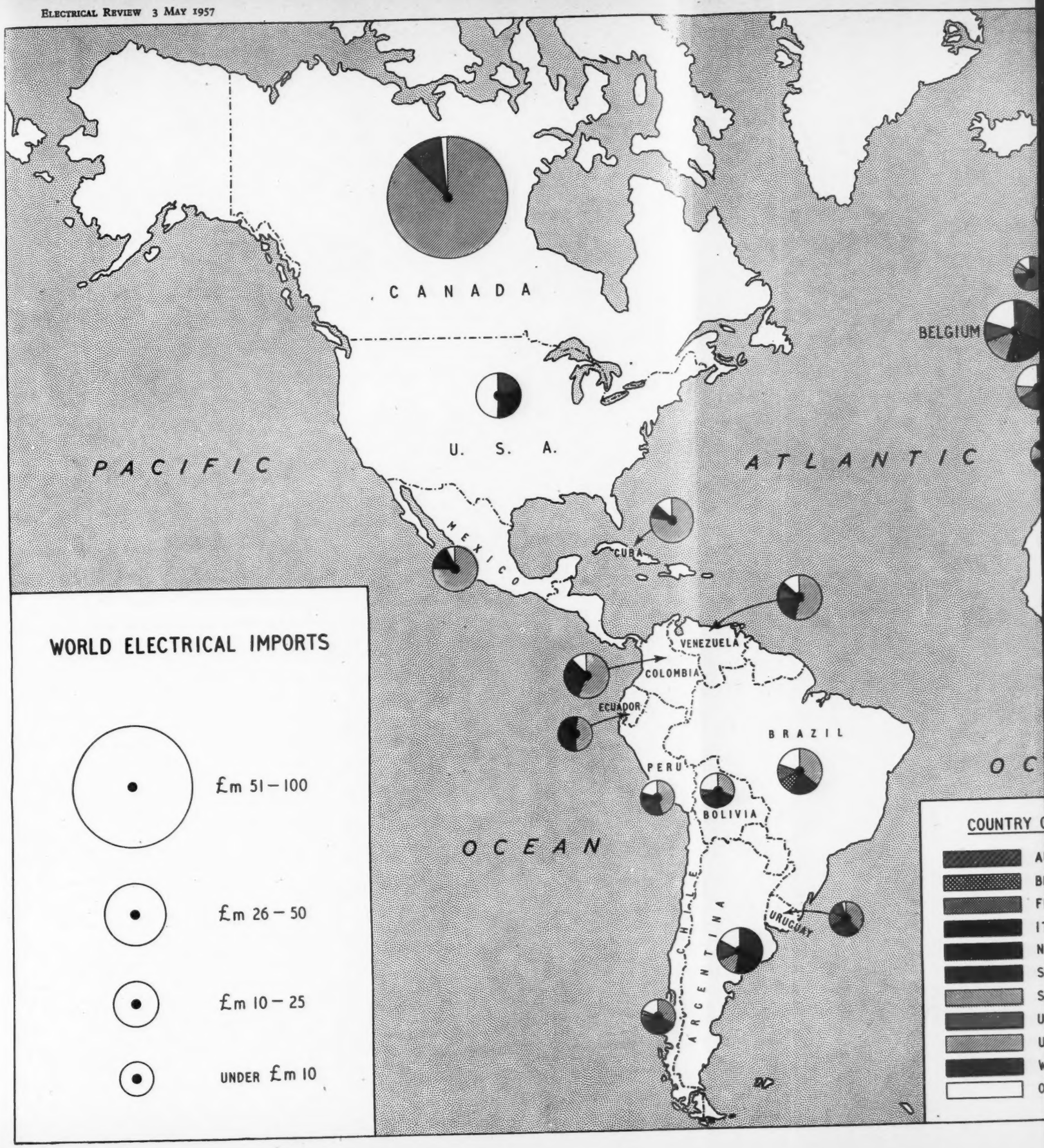
One of the most difficult, but at the same time interesting, European markets is Belgium. Common frontiers, similarity of language, and last but not least, the presence of a Common Trade Area, enables Holland, next to West Germany, to become the main supplying country. In spite of a large and competitive local industry, West Germany exported about £13 million to Sweden, the country's second best market. The corresponding figure for the United Kingdom amounted to £4·2 million. Among the Latin-American countries, Venezuela is by far the most important with imports valued at about £25 million, closely followed by South Africa. The United States imports came to £24·2 million, the United Kingdom supplying goods to a value of £5·2 million. The United Kingdom's electrical imports (£23·5 million) came mainly from Holland (£6 million), the United States (£5 million), and West Germany (£4·5 million). The bulk of Dutch and German exports to this country consisted of electronic products.

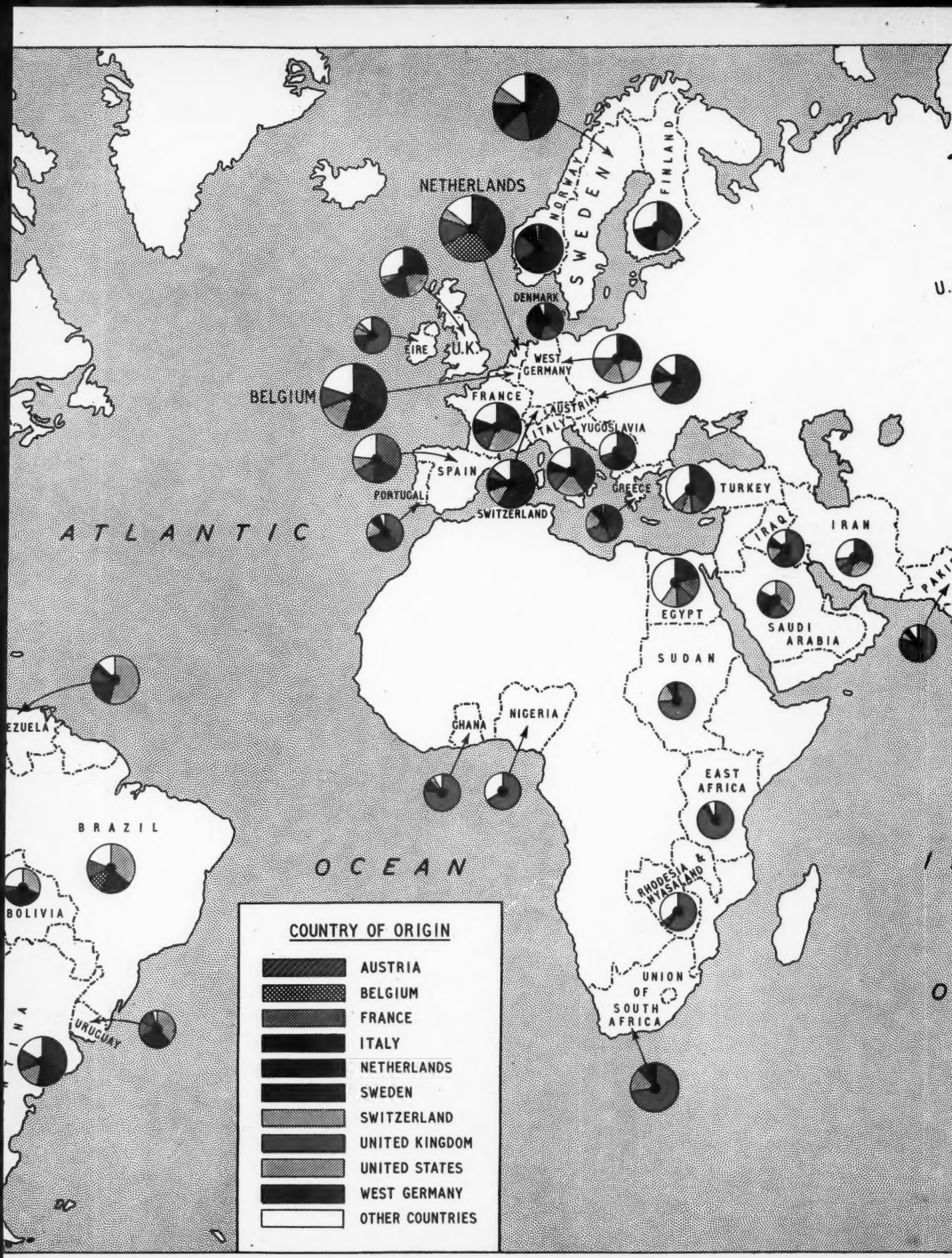
In view of the pending establishment of a European Free Trade Area, it may be helpful to survey the United Kingdom's trade with the six "Messina" countries; this is summarised in Table 1. It thus appears that the "Messina" countries together supplied 49 per cent of the United Kingdom's electrical imports, and took 9·4 per cent of her exports.

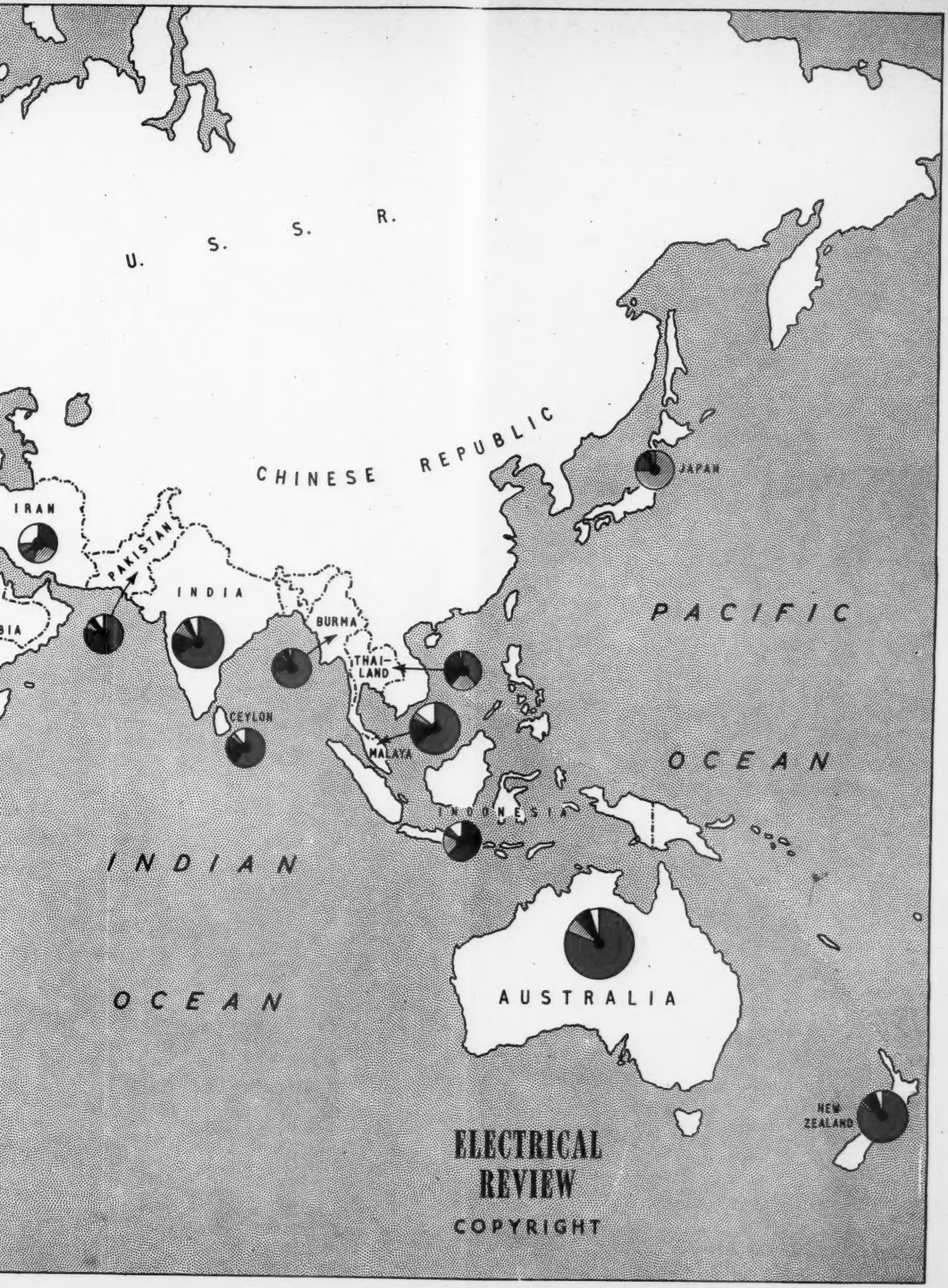
Table 2 shows the total import values of the countries included in our map and gives the value of the United Kingdom's share of the trade.

TABLE 2.—IMPORT TOTALS AND UNITED KINGDOM'S SHARE (£ million)

Countries	Total	U.K. share	Countries	Total	U.K. share	Countries	Total	U.K. share
Argentina	12·2	1·7	Finland	10·4	3·6	Portugal	5·8	2·2
Australia	28·8	22·6	France	21·8	3·1	Rhodesia & Nyasaland ...	9·7	5·8
Austria	10·5	0·5	Ghana	2·3	1·8	Saudi Arabia	5·3	1·0
Belgium	31·2	3·2	Greece	5·5	1·3	South Africa	24·8	18·0
Bolivia	1·6	0·02	India	25·3	16·2	Spain	11·2	1·7
Brazil	16·3	0·8	Indonesia	6·4	0·4	Sudan	1·2	0·9
Burma	2·5	1·8	Iran	6·7	0·8	Sweden	27·4	4·2
Canada	90·8	8·3	Iraq	5·5	2·3	Switzerland	15·5	1·0
Ceylon	2·5	1·5	Italy	21·2	2·9	Thailand	4·6	1·7
Chile	3·2	0·3	Japan	6·3	1·1	Turkey	10·9	1·2
Colombia	16·9	0·9	Malaya	10·4	6·6	United Kingdom ...	23·5	—
Cuba	12·9	0·3	Mexico	16·9	0·5	United States	24·2	5·2
Denmark	8·4	1·8	Netherlands	49·1	6·8	Uruguay	2·9	0·4
East Africa	5·7	5·1	New Zealand	15·0	12·3	Venezuela	25·3	2·4
Ecuador	1·8	0·04	Norway	14·4	3·4	West Germany	15·3	2·1
Egypt	13·2	1·7	Pakistan	8·4	3·8	Yugoslavia	7·9	0·7
Eire	6·9	4·1	Peru	6·5	0·6			


CANADA
U. S. A.
PACIFIC
ATLANTIC
OCEAN
MEXICO
CUBA
VENEZUELA
COLOMBIA
ECUADOR
PERU
BRAZIL
BOLIVIA
CHILE
ARGENTINA
URUGUAY
BELGIUM
WORLD ELECTRICAL IMPORTS
£m 51 – 100
£m 26 – 50
£m 10 – 25
UNDER £m 10
COUNTRY


NETHERLANDS
NORWAY
SWEDEN
FINLAND
DENMARK
EIRE
U.K.
WEST GERMANY
BELGIUM
FRANCE
AUSTRIA
ITALY
YUGOSLAVIA
SPAIN
PORTUGAL
SWITZERLAND
GREECE
TURKEY
IRAQ
IRAN
EGYPT
SAUDI ARABIA
SUDAN
GHANA
NIGERIA
EAST AFRICA
RHODESIA & NYASALAND
UNION OF SOUTH AFRICA
BRAZIL
BOLIVIA
URUGUAY
ATLANTIC
OCEAN
COUNTRY OF ORIGIN
AUSTRIA
BELGIUM
FRANCE
ITALY
NETHERLANDS
SWEDEN
SWITZERLAND
UNITED KINGDOM
UNITED STATES
WEST GERMANY
OTHER COUNTRIES


U. S. S. R.
CHINESE REPUBLIC
JAPAN
IRAN
PAKISTAN
INDIA
BURMA
THAI-LAND
CEYLON
MALAYA
INDONESIA
PACIFIC
OCEAN
INDIAN
OCEAN
AUSTRALIA
NEW ZEALAND
ELECTRICAL REVIEW
COPYRIGHT

E
E
A

D

I

Left: Turbine of a G.E.C. 60 MW set being erected at the Wilge (South Africa) power station

Below: Local staff, trained by the G.E.C., carrying out final tests in Suva (Fiji) telephone exchange

ELECTRICAL EXPORT ACHIEVEMENTS

Details of Some Recent Contracts

IN 1956 the United Kingdom electrical industry exported machinery, equipment and appliances to the value of £273 million thereby becoming the largest single exporting industry. British electrical manufacturers are able to supply practically every class of equipment required in any part of the world and to give some idea to overseas readers of their capabilities we have selected a few of the most interesting contracts handled by some of our leading manufacturers during the past year or two.

Among recent overseas contracts carried out by the General Electric Co., Ltd., is the 60 MW, 11 kV turbo-alternator commissioned during the past year at the Wilge power station of the Electricity Supply Commission of South Africa. This will supply the power required for the development of uranium ore deposits in the Witwatersrand gold mines and to augment the supply for gold mining and industrial purposes. The turbine is operated by steam at 600 lb/sq in and 850 deg F, and the alternator is air cooled. A further 10 MW, 11 kV set was commissioned at Bloemfontein in March.

A.c. motors totalling over 1,000 h.p. were supplied for the new Queen's Dock, Singapore, opened last year. This graving dock has a total capacity of 1·7 million cu ft or 11 million gallons. The two main de-watering pumps, driven by 400 h.p. synchronous induction motors, are together capable of emptying it in 2¼ hours. Vertical-spindle slipring motors with a continuous rating of 66 h.p. drive the two pumps for draining the suction chamber and culverts of the dock which have a combined rating of 6,000 gal/min at a total head of 43ft. A horizontal centrifugal pump rated at 1,250 gal/min at 80 lb/sq in, feeding sea water into a high-pressure main for fire-fighting and general purposes, is driven by a 110 h.p. slipring motor. Squirrel-cage motors with direct-on-line starters are used for the smaller auxiliary drives. High-voltage and low-voltage switchgear, control boards and the main control desk were also supplied under contract to Gwynne Pumps, Ltd., the main contractors.

Nine more complete 1,224 kW pumpless, air-cooled, steel tank mercury-arc rectifier equipments have been shipped in the past 12 months to the Netherlands Railways, bringing the total supplied to this administration up to 60,000 kW. All these equipments are fitted with control grids for arc suppression. The arc suppression gear operates on the G.E.C. triple-frequency tripping principle, in which a 150 c/s signal operates in either half-wave and the maximum delay, in terms of the 50 c/s supply, which can arise in the application of arc suppression is ½ cycle. Means are incorporated in the electronic circuit for ensuring that the rectifier is locked out if the arc suppression operates an excessive number of times in quick succession.

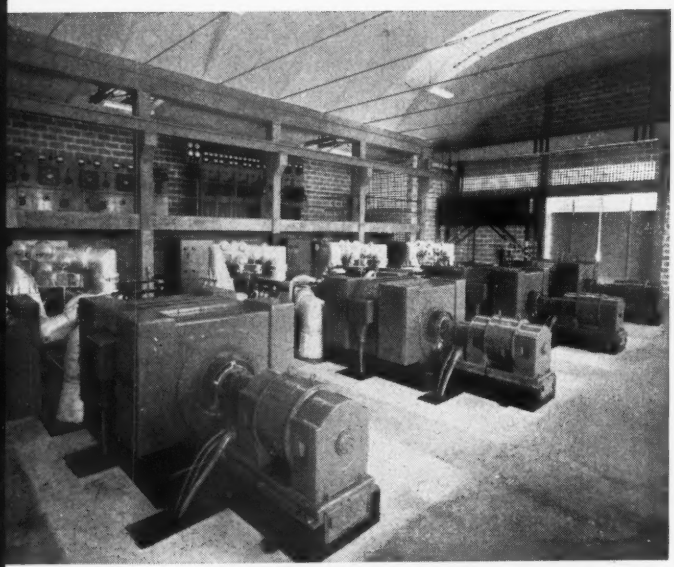
An automatic telephone exchange serving some 2,600 subscribers has been installed by the G.E.C. at Suva in Fiji. Local staff have been trained by the G.E.C. in maintaining automatic exchange equipment.

Engineers in British Columbia last year completed a

second installation of Pirelli-General 301 kV cable for the Aluminum Company of Canada, linking the underground power house at Kemano with the termination of the overhead line to the electrolytic tinning plant at Kitimat. A third order has since been received for a further three-phase circuit totalling some 6,000ft of cable, with accessories.

Overseas switchgear orders received by George Ellison, Ltd., have included a ten-way double-tier m.v. switchboard for the reservoir pump house, India Tube Works, for Stewarts & Lloyds, Ltd.; in this the main 600 A incomer and 150 A emergency feeder are interlocked. Twelve m.v. switchboards with from one to seventeen ways were exported to the Tata Iron & Steel Co., India, to the order of W. H. Smith & Co. (Electrical Engineers), Ltd., Manchester.

For the Wardieburn Estate dredging plant of Kampong



Four 900 kW Bruce Peebles generators driven by Ruston & Hornsby gas turbines at a Venezuelan cement factory

Lanjut Tin Dredging, Ltd., Malaya, the company supplied eleven m.v. switchboards, rotor starters for slip-ring motors and regulators. Another important order received through Birmingham Aluminium Castings, Ltd., Smethwick, was for Birmid Auto Castings Pty., Ltd., Victoria, Australia. It included seven m.v. switchboards (including one 28-way and one 10-way), rotor starters, direct-to-line starters, a 100 A star-delta starter and a 100 A circuit-breaker.

Last year the third 16,380 kVA, 12 kV zero lagging p.f. synchronous condenser supplied by Bruce Peebles & Co., Ltd., to the Electricity Trust of South Australia was put into commission. The three machines are all in one substation; they are automatically controlled and are operated to maintain the desired level of voltage on long transmission lines with varying conditions of power from power stations 200 miles apart.

Three 1,200 h.p. induction motors supplied by Bruce Peebles to the Electrolytic Zinc Co. of Australia, Ltd., drive compressors in a new sulphate of ammonia plant. Conspicuous among other industrial installations completed during the past year were four 900 kW Bruce Peebles generators driven by Ruston & Hornsby gas

The Oji River power station, Nigeria, visited by H.M. the Queen last year, is equipped with Reyrolle switchgear

turbines, running on natural gas, supplying power to the works of C.A. Cemento Carobobo, Sucra, Valencia, in Venezuela.

Flameproof motors of up to over 600 h.p. have been supplied to oil refineries in many parts of the world as well as hermetically sealed and "Pyroclor" filled transformers. Power transmission transformers have been provided for schemes in Canada, Uganda, New Zealand, India, South Africa and Holland.

For the Electricity Commission of Nigeria's Oji River power station A. Reyrolle & Co., Ltd., supplied 11 kV 500 MVA horizontal draw-out metalclad switchgear and 415 V switchgear for the station auxiliaries, and equipment for the main control room. This station was visited by H.M. the Queen and a photograph taken by the *Lagos Mail* during the inspection of the control room is reproduced. At the Ijora "B" station opened by Her Majesty in February, 1956, Reyrolle equipment includes 11 kV 500 MVA horizontal draw-out metalclad switchgear, 3,300 V and 415 V switchgear for the station auxiliaries, and equipment for the control room.

The Municipal Council of Georgetown, Malaya, ordered for its Penang power station Reyrolle 11 kV 350 MVA horizontal draw-out metalclad switchgear. The Port of Spain power station of the Trinidad and Tobago Electricity Commission which was opened last November contains eleven Reyrolle 11,400 kVA 350 MVA horizontal draw-out metalclad switchgear units, 415 V switchgear for station auxiliaries and equipment for the control room.

One of the most important of a number of interesting contracts fulfilled by Johnson & Phillips, Ltd., in 1956, was concerned with the cabling of the Ijora "B" station. Here the company carried out the entire installation of the power, control and telephone cables and the station's earthing system. They also manufactured and supplied all the power cable, a considerable quantity of the control cables, and the p.v.c. aluminium sheathed wiring cables for the lighting system. At the Oji River power station, work on which was in progress in 1956, all the power and multi-core cables for the installations are of J. & P. manufacture and supply.

Extensive use of J. & P. mains and wiring cables of both paper and rubber insulated types, was made throughout the new extensions of the Kilembe Copper Mines, Uganda. The work included the laying of a mains cable to Jinga substation where J. & P. aluminium sheathed

cable is installed to carry power to transformer and capacitor banks.

An order for the supply of cables, transformers, h.v. and l.v. switchgear, capacitors and distribution boxes was placed with the company in connection with the electrification of the No. 2 Mills of Mahendra Mills, Ltd., at Kalol, India. J. & P. supplied all the substation switchgear, h.v. and l.v. cables and cable accessories for the new international airport at Pava Lebar, Singapore.

Among overseas orders recently received by C. A. Parsons & Co., Ltd., is one for what will be the first 200 MW machines to be exported from England and the first to be installed in Canada. Three of these have been ordered by the Hydro-Electric Power Commission of Ontario for the Richard L. Hearn generating station, Toronto. Four 100 MW single-line turbo-generators were installed in this station by Parsons in 1951-53. The new machines are of the cross-compound design, the h.p. line running at 3,600 r.p.m. and the l.p. line at 1,800 r.p.m., each line being coupled to a 100 MW generator. The steam conditions are 1,800 lb/sq in and 1,000 deg F, with reheating to 1,000 deg F after partial expansion.

Two 66 MW, 3,600 r.p.m. turbo-generators have also been ordered for the Boundary Dam generating station, Saskatchewan, and two similar sets for a new power station near Winnipeg, on a site opposite Selkirk on the Red River. They will have two-cylinder turbines driving hydrogen-cooled generators with steam at 850 lb/sq in and 900 deg F.

Turbo-generators of 15 MW to 30 MW output have been ordered for power stations in Jamaica, India, Canada and Nigeria. An eighth 60 MW, 3,000 r.p.m. turbo-generator is being installed by the company in the Taaibos power station, South Africa, and two 30 MW sets have been supplied to the Brisbane City Council.

Other interesting overseas orders received by the company include one for eleven shunt compensating reactors for the Kariba hydro-electric scheme, Rhodesia. Two of these will have a rating of 40 MVA for installation at the Kariba power station and will be water cooled; the others will have a rating of 20 MVA and will be naturally cooled.

Another item completed during last year was a 5 MVA 132/33 kV transformer mounted on a trailer, to form part of a complete mobile substation for the Damodar Valley Corporation, India.

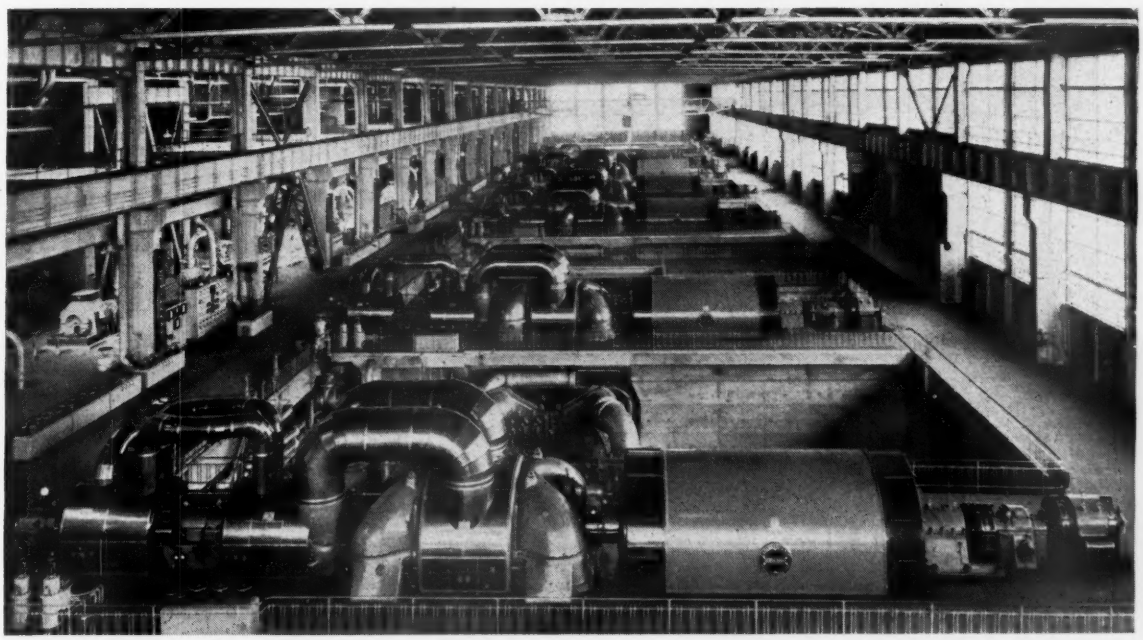
Transformers shipped abroad by Ferranti, Ltd., during the past twelve months or so include the second 111,000 kVA, three-phase bank of 275 kV transformers and the second 213,000 kVA, three-phase bank of 301 kV generator transformers for the Aluminum Company of Canada. The latter is believed to be the largest bank of transformers with aluminium windings in the world, and is installed in the underground power station at Kemano, British Columbia. This brings the total capacity of transformers supplied to this customer in recent years to 719,000 kVA.

Further export contracts completed during the year include two 169,500 kVA, three-phase banks of generator transformers for the U.S. Army Corps of Engineers, McNary Dam Project, Oregon; two 10,000 kVA, 110 kV transformers for the U.S. Bureau of Reclamation; and a number of contracts for transformers of up to 35,000 kVA for South Africa, India and New Zealand.

The outstanding order received during the year was for the supply of the 330 kV transmission transformers for the Kariba hydro-electric scheme on the Zambesi River of the Federal Power Board of Rhodesia and Nyasaland. This contract, covering two 120,000 kVA and ten 60,000 kVA, three-phase transformers, is claimed to be the largest overseas transformer order ever to be placed in Great Britain, and the first contract for 330 kV, three-phase transformers to be awarded to a British manufacturer.

The company has also supplied nine 60 MVA, 132 kV transformers for the Electricity Commission of New South Wales; one 60 MVA, 132 kV, three-phase bank of transformers for the Electricity Supply Commission of South Africa; one 100 MVA, 110 kV, three-phase bank and

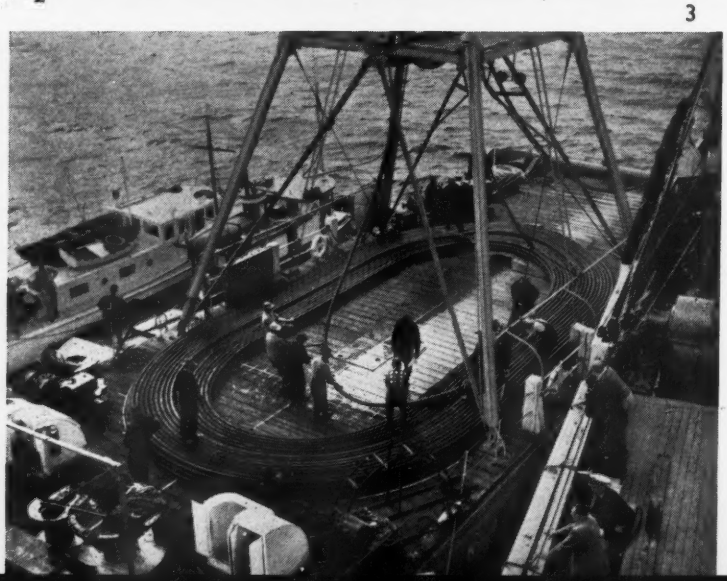
Seven 60 MW Parsons sets, to which an eighth is being added, in the Taaibos (South Africa) power station



1

2

3

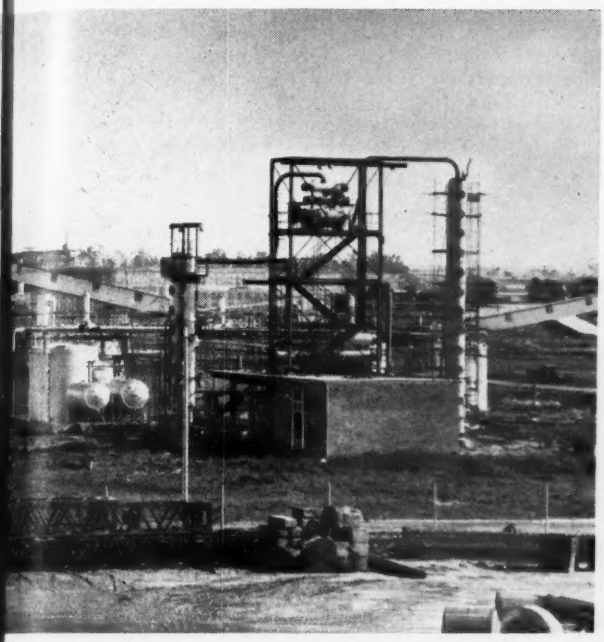


spare unit for the State Hydro-Electric Department, New Zealand; and one 80 MVA, 154 kV, three-phase bank and spare unit and four 12,000 kVA, 17 kV, three-phase transformers for the Tennessee Valley Authority, U.S.A.

Three Ferranti generator transformers forming a 189,000 kVA, 115 kV, three-phase bank have recently been shipped to the United States for the Dalles Dam hydro-electric project on the Columbia River. These form part of the contract awarded to Ferranti, Ltd., in 1955 by the Corps of Engineers, U.S. Army, covering eighteen 63,000 kVA, 230 kV, single-phase transformers, and three 63,000 kVA, 115 kV, single-phase transformers. This contract, valued at $2,080,940 (£746,000), was obtained against exceptionally keen American, British and Continental competition.

British Insulated Callender's Cables, Ltd., consider that the most important of the overseas contracts which they have carried out in the past year is that for the 138 kV cables linking Vancouver Island with the British Columbia mainland. A total length of about 50 miles was involved with several sea crossings of which the largest was across the Strait of Georgia, fourteen miles with a maximum depth of 100 fathoms.

To avoid joints, always a potential source of weakness, it was decided to produce the cable in a single length and the single-core gas-filled pre-impregnated paper-insulated type was therefore chosen with the gas pressure raised to 300 lb/sq in. This cable and its laying were described in an I.E.E. paper read last week which is dealt with on page 831.

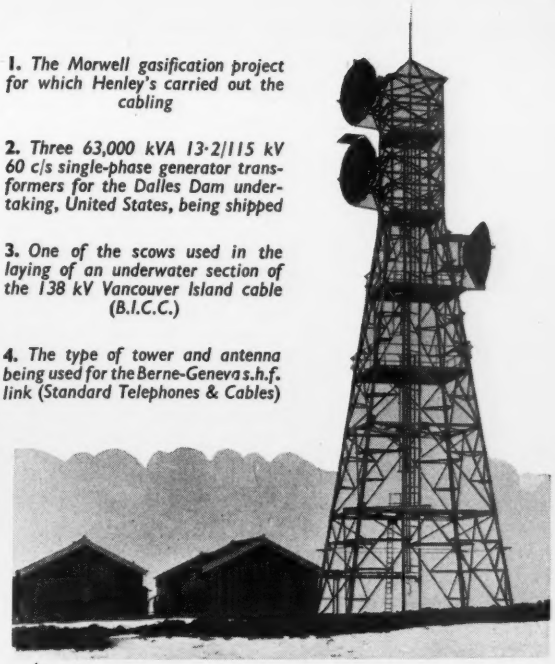


1. *The Morwell gasification project for which Henley's carried out the cabling*

2. *Three 63,000 kVA 13·2/115 kV 60 c/s single-phase generator transformers for the Dalles Dam undertaking, United States, being shipped*

3. *One of the scows used in the laying of an underwater section of the 138 kV Vancouver Island cable (B.I.C.C.)*

4. *The type of tower and antenna being used for the Berne-Geneva s.h.f. link (Standard Telephones & Cables)*



4

To manufacture the cable a special company—British Insulated Callender's (Submarine Cables), Ltd.—was formed and a completely new factory unit was laid out at Trafford Park, Manchester. Specially-built equipment included two large turntables, a length storage mechanism, and a lapping machine housed in an air-conditioned enclosure. The lead press was designed to run for periods up to twenty days without stopping, except for the few minutes necessary for recharging. A large coiling-down shed and a gantry to carry the cable from the factory to the shed and on to the dockside were constructed. Special joints were designed and manufactured.

Manufacture was practically continuous and the 91 miles of cable was produced in twelve months—well ahead of schedule. Many problems were encountered during the installation of the cable and a number of special measures were necessary in the handling of the overland and underwater sections but the operations were completed in about four weeks.

Last autumn saw the completion of the third stage of the Irish national network of underground telephone cables of the Department of Posts and Telegraphs. The first stage, begun in 1950, consisted of four sections of two-tube coaxial cables and associated carrier equipment to provide ultimately 600 two-way 2·6 Mc/s circuits between Dublin and Cork, Limerick and Waterford. The intermediate stage, providing a similar installation between Dublin and Drogheda and Dundalk, linking with a coaxial cable from Belfast, followed in 1952.

In the third stage there are three sections, Dublin to Mullingar, Dublin to Sligo, and Mullingar to Athlone. This 4 Mc/s multi-circuit carrier telephone network is mainly by two-tube coaxial but there is a short four-tube cable where the spur route from Mullingar to Athlone follows the main route to Sligo. The carrier terminal equipment can be expanded to a maximum of 960 circuits.

In all the stages provision was made for the interchange of broadcast programmes. The contracts for the supply and installation of the coaxial cable, carrier equipment and power equipment were carried out by Standard Telephones & Cables, Ltd.

Among other recent contracts placed with the Standard organisation was one from the Swiss Posts and Telegraphs for s.h.f. radio equipment to link Berne with Geneva, providing 600 telephone circuits over a single radio channel, with facilities for future extensions.

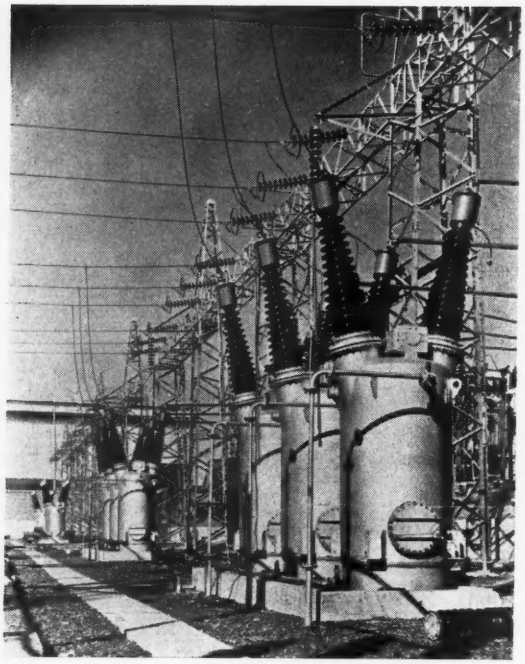
For the Portuguese postal and communications administration the company and its Portuguese associates are providing a comprehensive telecommunications network between Lisbon and Oporto and other places; the British share is valued at over £1·6 million. It includes about 400 km of six-tube coaxial cable with a parallel cable for short-distance audio- and carrier-frequency circuits. The backbone of the system will be a Standard multi-channel carrier telephone system of 960 two-way circuits over two tubes of the coaxial cable. There will also be provision for teleprinter and broadcast services.

For the New Zealand Post Office the company is providing, through its Wellington associates, equipment for a broad-band frequency-modulated s.h.f. radio system for the New Zealand trunk telephone network.

One of the most important overseas contracts with which W. T. Henley's Telegraph Works Co., Ltd., were associated during the past year was the transatlantic telephone cable for which the company supplied 45 miles of overland cable and nine nautical miles of submarine cable for the overland link across Newfoundland from Clarenville to Terranceville.

Typical of the many contracts which have been carried out in all parts of the world by Henley's Contract Department was the cabling of a large gasification plant for the Gas & Fuel Corporation of Victoria at Morwell in Australia. For this project Henley's Australian Contract Department installed some five miles of p.l.s.w.a. and s. cable and five miles of telephone cable—both supplied by Henley's—as well as about seven miles of other makes. This installation involved the design and fabrication of over 2,600ft of traywork and some idea of the wide variety of jointing involved may be obtained from the fact that some ten different types of switchgear of various makes were successfully connected up.

Another typical overseas contract was the cabling of the



B.T.H. 132 kV "Shuntarc" circuit-breakers at the Homebush sub-station of the Electricity Commission of New South Wales

Penang power station in Malaya for which Henley cables were used throughout. Among the many buildings all over the world in which the Henley rising main system has been installed are the two recent examples of the Central Board of Revenue Building, New Delhi, and the new Post Office in Salisbury, Southern Rhodesia.

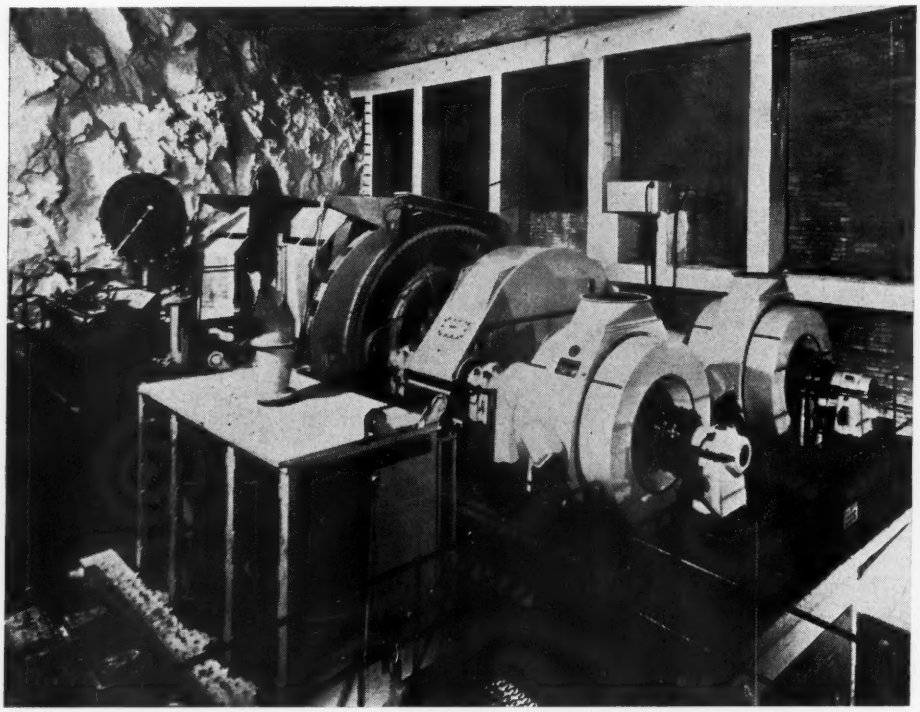
The overseas business of the Hackbridge & Hewittic Co., Ltd., was maintained during the past year. There has been a heavy output of transformers and rectifiers of moderate capacity, and in some cases contracts have been placed with the company in the face of strong local competition.

Shipments included two 5 MVA transformers for East Africa with two 10 MVA units to follow. Among other transformers in course of construction there are two reactors, a 15 MVA and two 20 MVA units for Queensland, four 10 MVA units for Madras, and a 9,260 kVA unit for Perak. A considerable number of rectifier equipments for railway traction duty and electro-chemical service overseas in capacities up to 6,000 kW are in course of production.

Last year 57 per cent of the total production of Newman Industries, Ltd., was exported. This unusually high proportion of exports is due chiefly to concentration in non-traditional markets for electric motors. For example, the company's two best markets were North America and Scandinavia with the traditional Commonwealth markets (excluding Canada) third.

The company is now represented with sales and service facilities in 62 different countries and Newman products were exported to 56 of these last year. Newman's share of the American market represented the major proportion of the total United Kingdom exports of electric motors to that continent. This success has followed the formation of an associate company, Newman Industries (America), Inc., a few years ago.

Orders for plant and equipment of a wide variety and for many overseas countries have been received or carried out by the British Thomson-Houston Co., Ltd., during the past year or so. Among the more interesting or unusual orders is one for two further sets (11 MW) for the Wairakei geothermal power station in New Zealand. The turbines are designed to operate with steam at 51 lb/sq in gauge, exhausting to a back-pressure of 16 lb/sq in absolute. An eighth 15 MW set is being supplied to the Ahmedabad power station in which there are already twelve B.T.H. sets. The company has provided the 40 MW generators for the Roxburgh hydro-electric station, New Zealand, and B.T.H. hydro-electric sets have been supplied to Australia, Uganda (Owen Falls) and Norway.



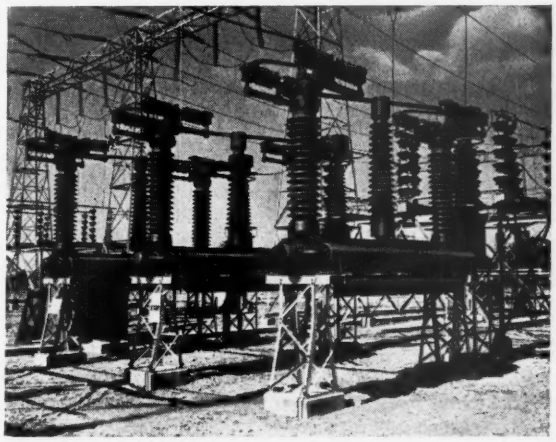
A 3,500 h.p. B.T.H. twin-motor drive a.c. geared mine hoist installed in a gold mine (Venterpost Gold Mining Co.) in South Africa

Switchgear contracts include 330 kV equipment for Kariba (Rhodesia) and large circuit-breakers for Australia, Canada, Pakistan, India and South Africa and there has also been as wide a spread of transformer contracts. One rectifier order carried out was for 78 pumpless rectifiers for the new aluminium plant of the Société Pechiney at Edea, French Cameroons. The line is rated at 95,000 A at 1,100 V. The order for the first of two 850 V, 100,000 A potlines for a new aluminium smelter in Canada was obtained by the company and germanium rectifiers completed included a 2,000 kW, 255 V set and a 30,000 A, 20/50 V set for the Société Pechiney.

The drive for a 12in continuous merchant rolling mill consisting of six B.T.H. 600 h.p. d.c. motors, a 3,000 kW synchronous m.g. set and control gear, has been put into operation. This was supplied to the order of Australian Electrical Industries Pty., Ltd., for the Broken Hill Pty., Ltd.

From the comprehensive range of equipment supplied to overseas customers by the Metropolitan-Vickers Electrical Co., Ltd., we illustrate two examples. The first is of four 75 MVA waterwheel generators, with main transformers and switchgear for the San Esteban hydro-electric station of Saltos del Sil—the largest power station in Spain. The fourth set was dispatched last year.

Four Metro-Vick 75 MVA waterwheel generators in Spain's largest power station—San Esteban



A 230 kV, 15,000 MVA (Type GA8W8R) air-blast circuit-breaker installed in Ontario, Canada

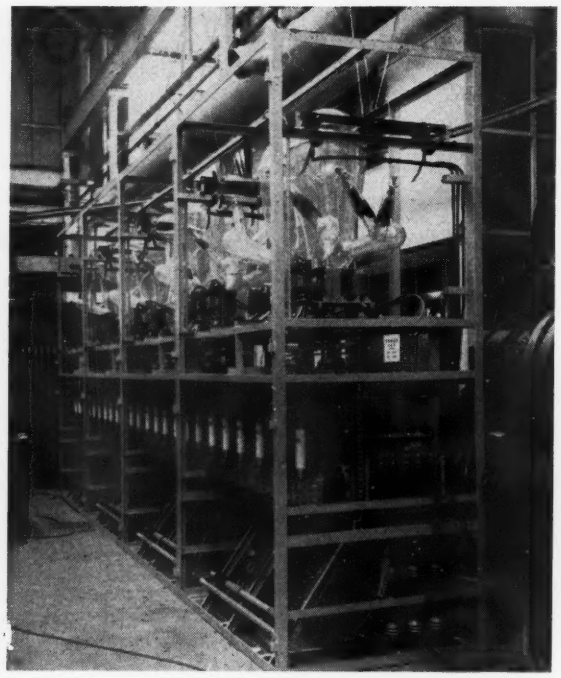
The second example is a 230 kV, 15,000 MVA Type GA8W8R air-blast circuit-breaker supplied to the Hydro-Electric Power Commission of Ontario. Type tests on this gear have been completed and the first circuit-breakers on the order have been installed.

Other noteworthy items which Metropolitan-Vickers have dispatched overseas are the third 20 MW set for the extension of the Catalagzi power station, Turkey (including steam plant); a second 66 MW, 3,600 r.p.m. hydrogen-cooled set for Wabamun (Calgary Power Co.), Canada; further sets (30 MW) for the China Light & Power Co., Hong Kong; mill-driving and other plant for the Titan cement works at Eleusis, near Athens; large winders for South African mines, including a second 3,240 h.p. Ward-Leonard direct-coupled automatic winder for the Premier diamond mine; and 3,820 h.p. 108 ton Co+Co electric locomotives for the N.S.W. Government Railways of which twenty-four of the forty ordered have been completed and fifteen had been put into service by the end of last year.

In April last year the Khatima power station in Uttar Pradesh, India, was officially opened. The contract to supply and erect all the plant and equipment for the power house, intake hydraulic equipment, discharge regulators, transformers and switching station was carried out by the English Electric Co., Ltd. The turbines of the three English Electric 17,250 kVA, 167 r.p.m. hydro-electric sets are of the feathering propeller type operating under a head of 59 to 63·6ft. The switching station includes three English Electric 17,500 kVA, 11/132 kV transformers and five 132 kV oil circuit-breakers.

A second English Electric 132 MVA, 13·8 kV, 60 c/s, 327 r.p.m. water-turbine-driven generator is being installed in the great underground Kemano power station of the Aluminum Company of Canada, Ltd. The Kemano station feeds the aluminium smelting plant at Kitimat in British Columbia, where a 70,000 kVA, three-phase, 60 c/s, aluminium-wound transformer, manufactured by the English Electric Co. of

Three 13·8 MW vertical shaft English Electric alternators in the Khatima, Uttar Pradesh, India, power station



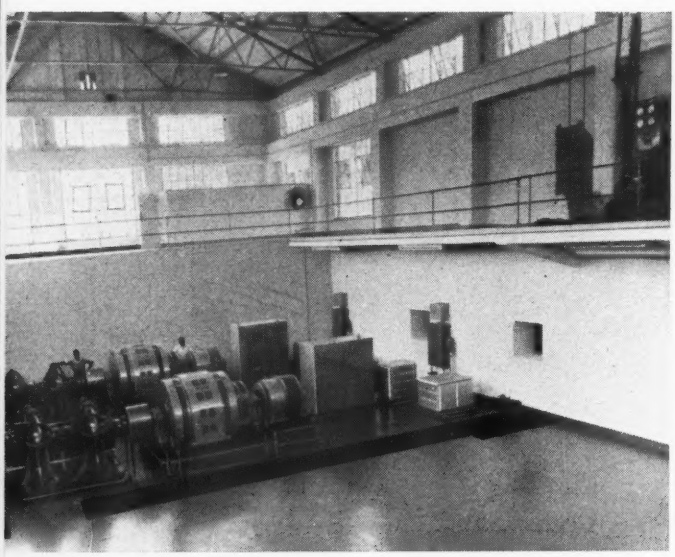
Mercury-arc rectifier (1,250 kW, 1,500 V) for traction duty in Canada (Lancashire Dynamo Nevelin)

Four English Electric single-phase units for a 200 MVA transformer bank for the T.V.A. being off-loaded at New Orleans

Canada, is in operation. An order has already been placed for a duplicate unit.

Four single-phase units for an English Electric 200 MVA three-phase transformer bank with spare unit have been supplied for the Tennessee Valley Authority's Rockwood power station, U.S.A. Among recent contracts received by the English Electric Co. from the T.V.A. is one for two 345 MVA, 165 kV generator transformers for a new power station at Gallatin, Tennessee; these are the largest three-phase units ever to be built. Other outstanding recent orders include two 162 MVA, 330/132 kV, three-phase banks for Sydney, N.S.W. and three 240 MVA, 330 kV, three-phase banks of generator transformers for Kariba Gorge power station, Rhodesia.

Two Allen 1,250 h.p. pumping units for the Hunyani Poort dam



Ten English Electric 30 MW steam turbo-alternator sets are now commissioned in the Vierfontein power station of the Electricity Supply Commission of South Africa, and a further two will be installed before the station is completed.

The first of two English Electric 5,000 kW, 3,000 r.p.m. steam turbo-alternator sets has been installed in the Burri power station of the Sudan Light & Power Co., Khartoum. A 10,000 kW English Electric turbo-alternator set is also on order. The Bout de L'Ile substation of the Quebec Hydro-Electric Commission contains eighteen English Electric 138 kV, 5,000 MVA air-blast circuit-breakers and a 330 kV, 10,000 MVA air-blast circuit-breaker is shortly to be delivered.

Work carried out by Laurence, Scott & Electromotors, Ltd., during the past year or so has included numbers of N-S variable speed a.c. motors. Some of the interesting contracts include a 750 h.p. 490/294 r.p.m. motor for briquetting plant for Yallourn power station, Australia. This machine (in view of the comparatively low top speed) is of high output for an a.c. commutator motor. Motors rated at 800, 300 and 200 h.p. have been supplied to a synthetic material production plant in Australia. Four 650 h.p. and four 350 h.p. N-S motors for i.d. and f.d. fans (International Combustion, Ltd.) have been ordered for the Tallawarra power station, Australia.

One contract about to be completed is for twenty-two 600 h.p. press motors, as well as many smaller machines, for briquetting plant at Morwell, Australia. Another out of the ordinary order is for two 1,250 h.p. water-cooled " Trislot " high torque squirrel cage motors for Boundary Dam power station, Canada.

During the year the company has continued to supply considerable numbers of motors for ships built on the Continent, including two bucket dredgers being built in Amsterdam, and electrical equipment for the trawl winches on twenty trawlers for Russia being built by Brooke Marine, Ltd. In a number of instances the control gear has been supplied.

W. H. Allen, Sons & Co., Ltd., supplied pumping equipment for a combined water supply and irrigation scheme recently put into commission in Southern Rhodesia. Water is obtained from a 55 million gallon dam on Lake McIlwaine and is supplied to the city of Salisbury as well as to a general irrigation scheme on the Hunyani River.

The main pumping station near the dam is equipped with two Allen two-stage pumps driven by 1,250 h.p. 1,500 r.p.m. synchronous induction motors. These deliver 400,000 gal/hr to the Warren Hills booster station 81,000ft away against a total head of 476ft. The booster station passes the water to a reservoir for meeting Salisbury's demand for about 5½ million gallons daily, a distance of 33,600ft. The two booster units consist of Allen single-stage double suction centrifugal pumps driven by 880 h.p., 1,500 r.p.m. motors operating against a total head of 330ft.

The company has been supplying steam generating plant to W. D. & H. O. Wills (Australia), Ltd., for nearly fifty years. The latest set, a 1,000 kW turbo-alternator, operates with steam at 195 lb/sq in and 540 deg F and passing out 20,000 lb of process steam per hour at 25 lb/sq in gauge. The turbine runs at 8,000 r.p.m. and the gear-driven alternator at 1,500 r.p.m.

Lancashire Dynamo Nevelin, Ltd., supplied a 1,250 kW, 1,500 V d.c. mercury-arc rectifier to Canada for traction purposes during the latter part of 1956. One of the illustrations on the opposite page shows the equipment on test at the company's works.

Work Starts at Ffestiniog

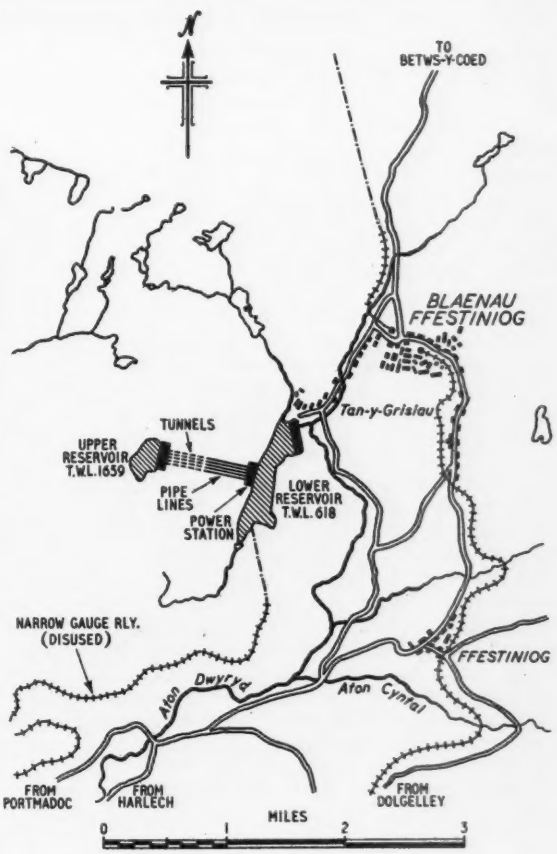
THE cutting of a turf at the site of the proposed Tan-y-Grisiau dam on 13th April marked the commencement of work on the Ffestiniog pumped storage scheme. This project, which was authorised by the North Wales Hydro-Electric Power Act, 1955, will be a pioneer of its type in this country, and is believed to be the largest so far contemplated in the world. The turf cutting ceremony was performed by Mr. T. W. Jones, J.P., Member of Parliament for Merioneth, who has been untiring in his efforts to get the scheme's Bill through Parliament. Hundreds of spectators watched from the hillsides surrounding the natural bowl which will form the lower reservoir.

In his introductory remarks, Mr. A. R. Cooper, controller of the C.E.A. North West, Merseyside and North Wales Division, described the nature of the scheme and said that it was an engineering job of international interest. He referred to the deputation of Welsh Members of Parliament, including Mr. T. W. Jones, to the C.E.A. when they asked for an atomic power station to be sited in Wales, and said that the pumped storage project made an atomic power station very much nearer, because a nuclear station was designed to work in harmony with such a scheme. He went on to say that whilst progress could not be stopped it could be deflected and shaped in such a way that it would not reduce the æsthetic content of our lives; properly handled, the great engineering venture which lay ahead could be an opportunity and a challenge.

In his address Mr. T. W. Jones said that the scheme had brought new hope to Blaenau Ffestiniog, which had suffered more from the depopulation problem than any other town in Great Britain. He recalled the stunning effect on the town when the credit squeeze halted the scheme last year, and praised the fight put up by Ffestiniog Urban District Council to persuade the C.E.A. at least to continue the work on the access road in order to disprove the fears that the scheme was to be entirely abandoned.

Referring to the possibilities of another project for the area, Mr. Jones assured Mr. Cooper that whatever scheme the C.E.A. introduced to benefit the county there would be no objection from the Merioneth County Council.

For a pumped storage scheme two reservoirs are required at a considerable difference of elevation. At Ffestiniog this requirement will be met by the enlargement of Llyn Stwlan as the upper reservoir and by damming the Afon Ystradau to form the lower reservoir 1,000 ft below. On the west bank of the lower reservoir the generating and pumping station will be constructed. Llyn Stwlan will be enlarged by the construction of a dam about 90ft high and 1,100ft long on its eastern side. In view of its situation, much thought has been given to the design and general appearance of this dam, and the type which is to be adopted will be a massive buttress structure



Mr. T. W. Jones, M.P., removing the first turf at the site of the Ffestiniog pumped storage scheme

built of concrete. On the water side of the dam two vertical shafts will be excavated to a depth of about 700ft. From the bottom of each shaft two horizontal tunnels will be driven, emerging on the hillside at a portal a short distance above the generating station. The country between the Stwlan Dam and the tunnel portal will be unaffected by the works.

Four steel pipes, each about 8ft diameter, will be laid from the tunnel portal to the generating station. These will be in deep cuttings so as to project as little as possible above ground level. As they will be so short no intermediate concrete anchor blocks will be required and thus a feature of hydro-electric stations usually criticised has been eliminated.

The lower dam across the Afon Ystradau valley at Tan-y-Grisiau is also of concrete, but will be of the gravity type with no buttresses. The spoil from the excavation of the dam will be disposed so as to conceal the downstream face over a long length, leaving at each end only a small section visible.

The generating station will house four units, each comprising a 100,000 h.p. water turbine, a 75 MW generator and pump. These four units will each have a vertical axis to ensure that there will be the smallest size of station building above ground; in fact, two-thirds of the whole station will be below ground level.

After considering many alternative layouts it has been found possible to accommodate the transformers and high-voltage switchgear behind the generating station. It is felt that in this position they are least obtrusive, and it has enabled the Authority to defer, possibly for many years, the construction of the outdoor substation which was authorised by the Act. A double circuit transmission line of the Authority's standard design for 275 kV will leave the area in an easterly direction.

Letters to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

A.C. Installations in Ships

IN reply to Mr. E. Jacks' letter published in your issue of 19th April, may I be allowed to point out that in presenting my paper before the Institute of Marine Engineers the primary object was to demonstrate the fallacy of building up large 200 V d.c. installations when we have to hand a much better alternative, namely, 440 V three-phase a.c., and the paper was never intended to be critical of the h.r.c. fuse for which I have the greatest respect.

From the user's point of view B.S. 88 gives a prospective current in association with a D.C.4 fuse of 33,000 A. Classification Rules give this same value, but designate it as the *maximum* prospective current. Further, the user cannot obtain an A.S.T.A. certified D.C.4 fuse, due, I am informed by fuse manufacturers, to the non-availability of suitable testing equipment.

In commenting on a.c. performance of h.r.c. fuses your correspondent appears to be quite happy with the value of 46,000 A (r.m.s. symmetrical) for the A.C.5 fuse and the assigning of a breaking capacity of 35 MVA at 440 V. On this basis it is perfectly reasonable for the user to assess the breaking capacity of a 250 V D.C.4 fuse as 8·25 MW. When fitted in relation to short-circuit capacities of 20 to 40 MW it appears to be far too low.

On a.c. installations at 440 V the A.C.5 fuse is ideal, not only in giving an assured breaking capacity of 35 MVA in itself, but also as back-up protection to circuit-breakers which have a limited breaking capacity of 15, 25 or 31 MVA according to current rating.

When dealing with protection, breaking capacity is not the sole criterion of good performance; by the use of h.r.c. fuses we shall also limit the thermal shock to the installation and to the stress due to electromagnetic forces, both of which are proportional to I^2, and also the danger from flash.

London, E.C.3. A. N. SAVAGE,
Assistant Superintendent Engineer (Electrical),
Royal Mail Lines, Ltd.

Proposed Dudley Society

IN view of the increasing interest in the "Atomic Age" I have often wondered whether a society could not be formed in Dudley to arrange electrical and other visits of an educational nature for employees, and others interested, in Worcestershire and Staffordshire.

I think that such an organisation would be most beneficial and I would welcome suggestions and recommendations on the subject.

Dudley, Worcs. WILLIAM J. COX.

Scottish Nuclear Power Station

A SCOTTISH correspondent says that a decision about the site chosen by the South of Scotland Electricity Board for its nuclear power station at Hunterston, Ayrshire, is likely to be delayed. An inquiry into the project was held about three months ago. It was presided over by Sir Randall Philip, Q.C., who became ill three weeks after the inquiry and he has so far been unable to make his report to the Secretary of State for Scotland.

It is considered that, failing an improvement in Sir Randall's health, the Secretary of State will have to make a decision one way or the other. Two alternatives have been suggested: a new public inquiry or the appointment of another Commissioner to report to the Secretary of State after a scrutiny of the record of the inquiry.

VIEWS on the NEWS

By REFLECTOR

I HAVE already commented on the conflicting views which are manifested in various areas of the country on the subject of nuclear power stations. One party objects to them on safety and "amenity" grounds while the other sees them as sources of employment for local labour. The Norfolk District Committee of the Eastern Regional Board for Industry has now joined the latter group because, it is said, there is considerable unemployment in building and civil engineering in the county. The Eastern Regional Board seems rather to be clutching at a straw for in a letter to the Ministry of Power the chairman has said:—

> "We have, of course, no specific sites in mind and we do not even know whether there are sites in the county which would meet the particular technical requirements."

* * *

Mention has been made in the *Electrical Review* of the proposed construction of an underground railway in Birmingham. When the matter was again discussed by the Corporation recently one member suggested that power for the railway could be provided by "one or more of the small atomic power stations now on sale." He said that one of these would occupy no more space than a tennis court and it could be put far enough underground to be out of harm's way. It would be far less trouble, I think, to take a supply from the Midlands Electricity Board.

* * *

I have noticed that hydro-electric schemes often confer incidental benefits as well as providing cheap power. In Scotland, for example, local industries have been encouraged, new fisheries created, and trade is brought to the Highlands through increased tourist traffic. In Uganda, too, the Owen Falls hydro-electric development attracts many visitors, and the latest report of the Electricity Board mentions another favourable outcome. In the past the presence of the mbwa fly has been troublesome, the insect being the carrier of onchocerciasis, or "river blindness." The raising of the water level between the Owen Falls and Lake Victoria has submerged the former breeding sites along that part of the river and the dam is now being used in further efforts to reduce the nuisance. Tests by the Uganda Medical Department have shown that the injection of D.D.T. into the Nile waters flowing through the sluices is an effective method of control.

* * *

About a year ago I recorded that the Fisheries Research Board of Canada was conducting experiments aimed at getting rid of sea lampreys of which there was a surfeit in the Great Lakes. These eel-like parasites were said to have practically destroyed commercial trout fishing in these waters. Now the *Daily Telegraph* reports that the Joint American-Canadian Great Lakes Fisheries Commission has asked for about £500,000 for controlling "all currently known sea lamprey spawning runs" in tributaries of Lakes Superior and Michigan. Barriers carrying an electric discharge are to be pushed out into the water to prevent the lampreys reaching their runs. The idea is probably to neutralise the electric fields which surround the lampreys' heads and thus make them lose their way.

* * *

The "Do it Yourself" movement seems to have caught on in Dublin in a big way. That city's *Evening Herald* recently published the following letter:—

> "Twenty families in the Phibsboro' district have joined to install their own electricity plant. I understand a similar scheme is being worked out by Donnybrook families. Why do not all householders in Dublin do likewise? The E.S.B. 'has killed the goose.'"

I should mention that the initials stand for the Electricity Supply Board which has not really done so badly for the Irish Republic.

* * *

The following item appeared in the preliminary agenda for the annual conference of the National and Local Government Officers' Association given in *Public Service*, the Association's journal:—

> "*Preston and North West Coast Electricity*: That this conference agrees that shorthand-typists and machine operators (more complex machines) should have parity on the maximum of their scale with the higher grade of general division...."

What machines could be more complex than shorthand-typists?

* * *

In a news sheet published by a well-known concern a headline announces "Modern Sweeney Todd Uses Electric Shavers." Although the sub-heading says "Cleaner and more efficient," I doubt whether this can be so for the sort of jobs that Sweeney Todd went in for.

* * *

In my researches into past volumes of the *Electrical Review* I have come across the following somewhat involved explanation in the issue of 3rd May, 1907:—

> "Mr. Charles Bright, F.R.S.E., M.I.E.E., lectured on Tuesday at the Cavendish Laboratory, Cambridge University, the subject being 'Submarine Telegraphy.' To our unspeakable regret, we spoke last week of Mr. Charles Bright as Mr. C. Bright. There is another Mr. C. Bright, who is also Mr. Charles Bright (an American, but no relation to Mr. Charles Bright the Englishman, and with whom Mr. Charles Bright, F.R.S.E., has no desire to be confused), and the omission of the letters F.R.S.E., etc., might give the impression to those who do not know any better that Mr. Charles Bright, F.R.S.E., was Mr. Charles Bright!"

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. G. R. Peterson, B.A., M.I.E.E., M.I.Mech.E., deputy chief engineer (generation and system operation) of the Central Electricity Authority, has been appointed as the deputy chief executive of the Federal Power Board of Rhodesia and Nyasaland. The Board, established in May, 1956, is at present constructing what will be the largest dam and power station in the British Commonwealth, at the Kariba Gorge on the Zambesi, and also an extensive 330 kV transmission system to connect it with a number of thermal stations in the Federation.

Mr. G. R. Peterson

A note on Mr. Peterson's career was published in our issue of 1st March, 1957, on his appointment to his present position; previously, since 1951, he had been generation operation engineer to the C.E.A.

Veritys, Ltd., have announced three new appointments. **Mr. P. H. Dallison,** M.I.Mar.E., has been confirmed in his appointment as manager of the Marine Department at Brettenham House, Lancaster Place, London, W.C.2, **Mr. Charles W. Boagey** has been appointed as district manager at the Glasgow office, and **Mr. J. D. Green** has been appointed to represent the company in the Merseyside area.

Mr. Dallison, who joined Veritys, Ltd., in 1955, received his early training at the Witton Works of the General Electric Co., Ltd., and for a short period was at the Summer Lane generating station of the Birmingham Corporation Electricity Department. Upon completion of his training he joined the engineering sea staff (electrical) of the Peninsular & Oriental Steam Navigation Co., and after fifteen years' sea service he was transferred to the Superintendent Engineer's Department at the company's head office, for duties in connection with electrical engineering, where he remained until his retirement in 1954 upon reaching the company's prescribed age limit. Mr. Dallison has served on the Ship Electrical Equipment Regulations Committee of the Institution of Electrical Engineers, where he represented the British Chamber of Shipping, and the Ships Cables Committee of the British Standards Institution, representing the Institute of Marine Engineers.

Mr. Boagey has been with the company for twenty years at the Glasgow Office and succeeds **Mr. E. Wells** who retired in May, 1956.

Mr. Green will be on the staff of the company's Manchester office.

Mr. P. H. Dallison

Mr. C. W. Boagey

Mr. J. D. Green

Sir George Nelson, Bt., chairman of the English Electric Co., Ltd., took office last Friday as president of the Institution of Mechanical Engineers for the ensuing year. Sir George is immediate past-president of the Institution of Electrical Engineers.

Newton Brothers (Derby), Ltd., have appointed **Mr. P. E. Waygood** as their London area manager, operating from their London office at Imperial Buildings, 56, Kingsway, W.C.2. **Mr. G. T. Maycock,** of 128, Manchester Road, Accrington, Lancs, has been appointed as the company's representative in Manchester and the North-West area.

Mr. P. E. Waygood

The British Welding Research Association announces that **Mr. Weck,** Ph.D., A.M.I.C.E., A.M.I.Mech.E., has been appointed director of research as from 17th June next. Dr. Weck took an honours degree in civil engineering at the University of Prague in 1936. He subsequently did post-graduate work on the plastic theory of structures, and worked as a designer and clerk of works on reinforced concrete and steel structures. He came to England in 1938, and spent the next four years with the Electric Furnace Co., Ltd., and Campbell & Gifford. He was appointed to the staff of the Welding Research Council in 1943, and acted as editor of the Institute of Welding Handbook on Structural Steelwork. He was subsequently seconded to the staff of Professor Baker at the University of Cambridge Engineering Department for work for the Admiralty. In 1951, Dr. Weck was appointed a lecturer in the Department of Engineering, Cambridge University. In the meantime he has continued to give advice to the B.W.R.A. and to serve on many of its committees.

The Metropolitan-Vickers Electrical Co., Ltd., announces that the Traction Department has been organised as a division of the company and **Mr. F. Whyman,** B. Sc. Tech., M.I.E.E., has now been appointed chief engineer, Traction Division, in addition to his duties as chief engineer, Traction Projects Department. The new Division co-ordinates all the M.-V. company's traction interests, including those in the Stockton Works of Metropolitan-Vickers–Beyer, Peacock, Ltd.

Mr. F. Whyman

After taking an honours degree at Manchester University, Mr. Whyman joined Metropolitan-Vickers in 1924 as a trainee in the Traction Department. He continued as an engineer in the Traction Control Department until 1944, when he was appointed chief engineer, Traction Projects Department. During his association with the department Mr. Whyman has travelled widely in connection with the company's traction contracts overseas.

The Ministry of Supply, with the agreement of the War Office, announces that **Colonel C. A. Zweigbergk,** M.C., has been appointed Director, Inspectorate of Electrical and Mechanical Equipment. On taking up this appointment Colonel Sweigbergk will be granted the acting rank of brigadier.

Mr. T. D. Shillcock has been appointed Creda area sales engineer for the Simplex Electric Co., Ltd., in the Midlands and South West of England. The present Creda sales engineers will continue to work in these areas under his supervision. Mr. Shillcock was educated at Rugby School and received his commercial training in the electrical wholesale trade. He joined the Simplex Electric Co., Ltd., in 1937 as representative

in the Home Counties. He served in the Royal Signals during the war and now holds the rank of major in a T.A. squadron. Returning to Simplex in 1946 he represented them in the East Midlands, becoming sales engineer in that area in 1953 and in the Midlands in 1954. **Mr. E. S. Payne** will take over Mr. Shillcock's present area in the Midlands.

Three senior contract sales representatives of Hoover, Ltd., have just retired. They are **Mr. R. F. Chant,** London contract sales representative at Hoover House; **Mr. W. Ellison,** contract sales representative for the north-west branch with headquarters at Liverpool; and **Mr. A. V. Ford,** contract sales representative, western branch, with headquarters at Bristol. They have each been presented with a canteen of cutlery by Mr. T. A. Browne, contract manager, on behalf of the company's directors, while their colleagues have made them presentations of glassware.

Mr. P. J. Squire, B.Sc.(Eng.), A.M.I.E.E., is leaving the Central Electricity Authority on 10th May to join the Technical Operation Department of the International Bank of Reconstruction and Development, Washington. Mr. Squire was educated at Abingdon School, Berks., and Faraday House. He joined the former Central Electricity Board in 1934 as an assistant engineer in the Commercial Department. In 1936 he went to the Anglo-Iranian Oil Co. as a development engineer, but returned to the C.E.B. in 1941, holding the successive positions of assistant engineer, Commercial Department, and chief assistant operation engineer. Upon nationalisation he became system operation engineer at the headquarters of the British Electricity Authority, to which he later added the duties of planning engineer.

Mr. P. J. Squire

A few weeks ago we announced the pending winding-up of the Electric Lamp Manufacturers' Association of which **Mr. W. J. Jones,** M.Sc., M.I.E.E., F.I.E.S., was director. It is now announced that Mr. Jones took up on 1st April the appointment of director of the Electric Lamp Industry Council, the formation of which was reported in our issue of 1st February.

Mr. W. J. Jones

As we then stated, the chairman of the E.L.I.C. is Mr. J. G. Christopher (Thorn Electrical Industries, Ltd.) and the secretary is Mr. E. J. Counter.

Mr. E. A. Grauer, president of the B. C. Electric Co., Ltd., Vancouver, has been elected Chancellor of the University of British Columbia. Dr. Grauer is a former Rhodes scholar.

The next general meeting of the **Electrical Trades' Commercial Travellers' Association** will be held on 10th May (6.30 p.m.) at the Feathers Hotel, Broadway, Westminster, London, S.W.1; supper will be available.

The finals of the snooker tournament of the Midlands Branch of the Association was held recently in Birmingham when Mr. J. E. Oakley, the winner, was presented with the trophy by Mr. C. J. Nash, the branch chairman. The accompanying picture was taken at the recent annual ladies' night of the Branch.

At the recent ladies' night of the Midlands Branch of the Electrical Trades' Commercial Travellers' Association held in Birmingham. Left to right: Mr. F. A. Bartlam (vice-president), Mr. W. J. Jones (president), Mr. C. J. Nash (branch chairman), Mr. F. J. E. Simons (national chairman) and Mr. S. Le Marechal (branch vice-chairman) with their ladies

The North Western Branch is holding a general meeting on 13th May (7.30 p.m.) at the "Waggon and Horses," Southgate, Deansgate, Manchester, which will be followed by a lecture and film on "The Port of Manchester," by Mr. M. R. A. Bell. The annual bowling match will be held on 4th June (7 p.m.) at the "Eagle and Child," Higher Lane, Whiterfield.

Major-Gen. Sir Richard G. Lewis, K.C.M.G., C.B., C.B.E., has been appointed to the board of Associated British Engineering, Ltd., as a non-executive director.

Mr. R. J. Francis has been appointed manager of the Infra-red Heating Division of Thermodare (Great Britain). He has had many years' experience of infra-red and has been responsible for some of the largest installations in the South of England. For the time being, in addition to his activities as manager of the division, he will also be looking after the South-East of England for all Thermodare products.

Mr. R. J. Francis

Nearly 800 visitors and guests attended this year's luncheon of the **Institute of Fuel,** which took place on 25th April under the chairmanship of its president, Mr. J. R. Rylands. Replying to a brief introductory speech by the president, Sir John Maud (Permanent Secretary, Ministry of Power) mentioned the appropriateness of the fuel industries' representation by Lord Mills in the Cabinet, the seat of power. It seemed probable, he said, that by 2000 A.D. the energy equivalent of 7,500 million tons of coal would be needed by the world as a whole compared with 2,750 million tons at the present time. Nuclear power would therefore be a very necessary supplement to the more conventional power resources and the world would await a lead from Great Britain. In the meantime fuel technologists would have splendid opportunities, for example, in investigating the best means of using small coals.

Ten women and eight men have won their way through to the national finals of the 1957 **E.D.A. Public Speaking Competition** and on 8th May (women) and 9th May (men) they will attempt to win the competition's main awards, the Faraday Silver Challenge Shields.

A good audience does a great deal to inspire the speakers, and E.D.A. would welcome anybody who would like to attend the contests, which are to be held in the Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2. Competitors will start to speak at 11 a.m. and 2.15 p.m. on each day,

and the results will be known at 4.30 p.m. Well-known B.B.C. and other personalities will judge the competition. The present shield holders are the South of Scotland Electricity Board (women) and the Yorkshire Electricity Board (men). This year's contestants are:—

Women's Section: Mrs. V. R. Eagle-Bott (South Eastern), Miss A. Levitt (South Western), Miss R. J. D. Scrivener (Eastern), Miss B. Jackson (East Midlands), Miss P. W. Leith (Midlands), Miss J. M. Williams (Merseyside and North Wales), Mrs. I. Bird (Yorkshire), Miss A. R. Haseldene (North Eastern), Miss C. Currie (North Western) and Miss J. R. Howie (South of Scotland).

Men's Section: Mr. D. W. Lithgow (South Eastern), Mr. H. L. Watkins (South Western), Mr. E. G. Savage (East Midlands), Mr. P. Watkins (Midlands), Mr. B. H. Derbyshire (Merseyside and North Wales), Mr. A. W. Fergusson (Yorkshire), Mr. D. I. Wrigley (North Western) and Mr. K. D. Brown (South of Scotland).

Mr. C. H. Gittins, commercial officer, Wrexham District, Merseyside and North Wales Electricity Board, has received a farewell presentation from the staff on his retirement. The presentation was made on behalf of the staff by Mr. E. J. Brett, Wrexham district manager.

OBITUARY

Mr. W. A. Brown, A.M.I.E.E., A.M.I.Mech.E., who died suddenly on 25th April, had been sub-area engineer of the Eastern Electricity Board's Northmet Sub-Area since nationalisation of the industry in 1948. Previously he had been electrical engineer and manager with the First Garden City, Ltd., Letchworth. He had a varied experience in electricity supply and manufacturing with the British Thomson-Houston Co., the English Electric Co. and Johnson & Phillips, including a period on the Continent on electric traction work.

Sir Murdoch Macdonald, K.C.M.G., C.B., M.I.C.E., who died on 24th April at the age of ninety-one, was president of the Institution of Civil Engineers in 1922-23. He was concerned with a number of important water supply and irrigation projects and was responsible for two of the North of Scotland Hydro-Electric Board's schemes. He was also a joint consulting engineer for the Aswan Dam power scheme.

Mr. F. H. Williams.—The death occurred on 21st April at the age of eighty of Mr. F. H. Williams who, until his retirement in December, 1948, was chairman and managing director of the Jackson Electric Stove Co., Ltd. Mr. Williams (with Messrs. T. and J. Jackson) founded the company in 1910 and he was largely concerned with the pioneer and development work in electric cooking, to which he first directed his interest as long ago as 1899. The funeral was held on 26th April at Woking Crematorium.

Mr. Arthur Tyler Brotherton, formerly a director of the Brush Electrical Engineering Co., Ltd., died on 16th April at the age of eighty-nine. He was apprenticed to the company and worked with it for fifty-four years, being a director from 1930 until he retired in 1938.

Mr. Frank Jones, M.I.E.E., M.I.Mech.E., deputy company plant engineer, Babcock & Wilcox, Ltd., Renfrew, died in Killearn Hospital, Stirlingshire, on 22nd April, after a sudden illness.

Mr. A. Fitzsimmons.—The death, on 26th April, is reported of Mr. Arthur Fitzsimmons, A.M.I.E.E., who was Mayor of Chingford, Essex, in 1950-51.

Mr. E. Dadswell, who up to his retirement in 1950 was for thirty-eight years station superintendent in the former Keighley Corporation electricity undertaking, died suddenly on 15th April at the age of seventy-one.

Mr. Edgar Llewellyn Morcom, M.I.Mech.E., late of Belliss & Morcom, Ltd., died on 23rd April at the age of seventy-six.

WILLS

Brig.-Gen. Wade H. Hayes, O.B.E., chairman of Edmundsons Electric Co., Ltd., and director of English Electric Co., Ltd., D. Napier and Son, Ltd., and Marconi's Wireless Telegraph Co., Ltd., who died on 4th September last, left estate in England valued at £51,264 gross (£45,079 net).

Mr. H. W. P. Matthey, chairman of Johnson, Matthey & Co., Ltd., who died on 6th March last, left £440,514 gross (£433,178 net).

Mr. B. Davies, F.Inst.P., A.M.I.E.E., at one time private assistant in physical research to Sir Oliver Lodge, and later chief of the Research Department of the Eastern and Associated Telegraph Co., who died on 20th February last, aged 93 years, left £2,445 gross (£1,759 net).

Mr. H. H. Holmes, chairman and managing director of Berry Wiggins & Co., Ltd., who died on 20th February last, left £87,813 gross (£77,359 net).

Mr. J. G. Bland, A.M.I.E.E., manager of the Bletchley District of the East Midlands Electricity Board, who died on 28th January last, left £6,571 gross (£4,715 net).

Mr. S. Taylor, M.B.E., M.I.Mech.E., chairman and managing director of the General Engineering Co. (Radcliffe), Ltd., and chairman of other companies, who died on 29th January last, left £240,566 gross (£236,741 net).

Mr. A. H. Cash, for 35 years with the British Thomson-Houston Co., Ltd., who died on 24th January last, left £4,376 gross (£2,470 net).

Mr. C. E. Tavener, late managing director of Cables Investment Trust, Ltd., and a director of other companies, who died on 28th December last, left £66,535 gross (£59,959 net).

Mr. T. H. Sutcliffe, for 26 years manager of the Marine Department at the Newcastle office of the General Electric Co., Ltd., who died on 8th December last, left £13,400 gross (£11,526 net).

Mr. A. J. Young, late managing director of Electroway Heaters, Ltd., who died on 5th December last, left £18,703 gross (£17,510 net).

G.E.C. Acquisition

The Simplex Dairy Equipment Co., Ltd., announces that negotiations have been concluded whereby a share interest in that company has been acquired by the General Electric Co., Ltd. The board of the Simplex Dairy Equipment Co., Ltd., will now consist of Mr. F. E. Rowland (chairman), Mr. E. M. Bond-Smith (deputy chairman and managing director) and Messrs. M. Bond-Smith, W. G. Cover, C. S. P. Mallam and A. Perrott.

The activities of the Agricultural Department of the G.E.C. have been transferred to the Simplex Dairy Equipment Co. and its associated company, Agricultural Supplies (Cambridge), Ltd., both of Cintra House, Cambridge. The agricultural and horticultural specialities at present marketed by the G.E.C. will in future be distributed by Agricultural Supplies (Cambridge), Ltd.

Australian News

The Western Australian seaport of Bunbury is to have a new turbo-generator supplying Perth by 1961. The Minister-in-Charge of the State Electricity Commission, Mr. Tonkin, has now approved the calling of tenders for a 30 MW alternator, boilers and auxiliaries.

Holders of more than 90 per cent of shares in Federated British Engineering (New South Wales), Ltd., and Electric Control & Engineering, Ltd., have consented to a merger of the two organisations.

During the first half of the financial year 1956-57 there was a cut of 20 per cent in the Australian production of domestic electricity meters, while the output of electric bath heaters fell by 15 per cent.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £240 10s 0d
Fire Refined 99·70%	ton £239 0s 0d
Fire Refined 99·50%	ton £238 0s 0d
COPPER Tubes ..	lb 2s 3½d
Sheet	ton —
H.C. wire and strip ..	ton £290 15s 0d
LEAD, English ..	ton £108 0s 0d
Foreign	ton £107 0s 0d
MERCURY	flask £86 0s 0d
TIN, block (English) ..	ton £770 10s 0d
ZINC, G.O.B. Foreign	ton £94 0s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 11½d
Sheet	ton —
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 0d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 26⅞d—27d

Electrical Research

SUBSTANTIAL INCREASE IN INCOME NEEDED BY THE E.R.A.

THE thirty-sixth annual report of the British Electrical and Allied Industries Research Association (E.R.A.), covering the year 1956, was published this week. When budgeting for the past year it was recognised that with rising costs the research programme could result in a deficit. This deficit, however, was less than the budget figure, partly because the income exceeded that allowed for, and partly because of economies made. Because of increases in costs at the new premises at Leatherhead the adverse margin between present income and estimated expenditure in 1957 will be considerably greater than in 1956. Apart from that a substantial increase in income is now necessary if the Association is to continue to receive the comparable grant from the Department of Scientific and Industrial Research.

The move to the new laboratories at Leatherhead was made during June and, necessarily, research programmes were interrupted but everything proceeded smoothly and no unforeseen difficulties arose. The Association has successfully negotiated the sale of the Perivale premises, the agreement providing for the retention of that portion needed for the work, mainly on switchgear, which has to remain at Perivale until the next stage of the Leatherhead site is completed.

The Council has appointed Dr. H. G. Taylor as director; he took up his appointment on Wednesday last, 1st May. Dr. Taylor was at one time on the staff of the Association and has for the past eight years been the director of the British Welding Research Association. He succeeds Dr. S. Whitehead who died in May last year. During the year the first director, Mr. E. B. Wedmore, and Mr. H. C. Silver, who was the first of the early committee secretaries, also died. The Birthday Honours List for 1956 included the name of Mr. E. W. Golding, who was awarded an O.B.E.

Insulation Investigations

The year's work is classified under eighteen main headings, the majority of which can be related either to materials or apparatus. Under the heading insulation, the factors determining the discharge inception stress in void-free impregnated dielectrics are being intensively studied. The work, starting with oil-impregnated paper, has been extended to impregnated plastic films, with results which suggest that very high working stresses may be practicable. A new study has been started on the mechanism of conduction through dielectrics containing traces of moisture. The introduction of discharge detection methods into industry is proceeding satisfactorily and extensive data are now available on the resistance to discharges of various materials.

Under "circuit-breaking," significant practical advances have resulted from further work on circuit interruption at high vacuum, both at high powers and at those appropriate to contactors. The range of the formulæ for calculating pressure in the pots of side-blast baffle oil circuit-breakers has been extended, and study of form and movement of the arc path in these breakers has begun. Substantial contributions to the study of post-arc conductivity and of the temperature of the steady state arc have been published. The discovery that arc temperatures are higher than had been supposed has important consequences in a number of fields, including arc welding. Reports on field tests on switching idle transformers and on protection of series capacitors have clarified important issues and field measurements have been made on restriking voltage during short-circuit tests at 132 kV and on phase and neutral voltages of generator-transformer groups during earth fault with neutral earthed by different methods.

In connection with flameproof equipment, tests have been continued with an 800 h.p. motor running at rated speed with explosions of both pentane and a hydrogen-methane mixture with air. A new flanged explosion vessel for the determination of safe gaps, in which the flanges are fully restrained, is to be used for a study of the maximum safe gap for hydrogen and acetylene. An experimental oil-filled switch vessel is under construction for heavy power tests to determine the head of oil necessary to ensure that the hot gases evolved during switching are cooled sufficiently to prevent risk of explosion above the oil level.

High-Temperature Steels

Under the heading of steam and high-temperature steels, work on determination of dissolved oxygen in water has ended with the development of a satisfactory discontinuous method with a precision within $\pm 0{\cdot}0002$ p.p.m. Plant in connection with the extension of the steam tables to 5,000 lb/sq in and 1,400 deg F has been brought into use and substantial progress made. An interim report is to be published on researches at the National Physical Laboratory on bolt steels, steam pipes, superheater tubes and turbine castings, and steelmaking firms have co-operated with the N.P.L. in obtaining creep data for austenitic alloy steels. The range of materials covered by the work has been extended. Furthermore, a new sub-committee has been formed to study the properties of titanium alloys of interest to turbine builders.

Reports on lightning faults continue to be received and in addition to the study of other protective devices, special attention is being paid to the protective effect of standard duplex gaps on transformer bushings. At the N.P.L. the study of corona and the impulse characteristics of insulation has been continued. With the installation of the new 2·8 MV surge generator at Leatherhead it will be possible for the E.R.A. to collaborate more closely with the N.P.L. in the latter work.

The production of the text book on inductive interference has been arranged and much effort has been devoted to international discussions and to consultation with members on possible interference from 50 c/s track systems. Many appliances have been examined to check comparisons with Continental regulations for suppression and an interference measuring set up to 600 Mc/s is being constructed to Post Office design.

Under the heading of wind power, work has continued and consideration has also been given to some special uses of wind power such as for cathodic protection. In collaboration with the Danish Wind Power Committee, preparations have been made for the testing of a new 200 kW wind-driven generator at Gedser.

The study of problems involved in the ventilation of transformer cubicles has been continued and methods

of calculating stray losses in transformer windings have been extended to types of winding not previously considered. Various problems arising from the use of anisotropic steel are under investigation, including the problem of ageing, although present information does not suggest that this is serious. Most of the problems involved in the calculation of mechanical forces in transformer windings have been solved, but consideration is being given to the possibility of achieving greater accuracy by the use of a digital computer.

In connection with earthing and fire risks the draft Code of Practice on Earthing has been circulated to industry by the B.S.I. and some amplification as regards earth leakage protection is nearly complete. Protection of electrically operated tools for use outdoors, the requirements for differential current earth leakage circuit-breakers, and means of measuring earth fault loop impedances have been under review. Tests have been made on the effects on an external water main system of stray currents associated with an adjacent a.c. transmission system.

With regard to equipment for testing insulation, two members now market dispersion meters to meet the demand for use in manufacture. Models with increased sensitivity, and one with extended test interval intended for the control of drying processes of cable papers, have been developed. A prototype direct reading electronic power factor meter has been constructed and designed to facilitate field testing of insulation.

Recent advances in rural electrification have intensified the interest in the uses of electricity on farms. Some of the older researches are nearing completion and preparations have been made for starting new work. Useful guidance as to future policy was obtained as the result of a two-day conference under the chairmanship of Sir Harold Hartley. The heat pump for combining milk cooling with water heating has been operated throughout the year with a commercial compressor unit in place of the original special unit. Researches on soil warming and the effect of various types of light have been continued and have included a new wiring arrangement for use out of doors. The use of high-frequency fields for pest control now includes the use of centimetre waves.

Heating Methods

The study of practical floor-heating installations has continued, with laboratory studies on the efficiency of embedded and withdrawable systems, the effect of edge and under-floor insulation, and the effects of carpets. The performance of the three types of storage heating in the new Leatherhead laboratories is being carefully observed. Study of the performance of the Shinfield heat pump has continued over a further year, and the performance of experimental heat pumps for domestic water heating and larger cooling has been observed in six houses forming part of a large-scale experiment organised by the Utilisation Research Section of the C.E.A.

Under the heading of electrical equipment for automotive systems, tests on semi-conductor plugs for gas turbine ignition have been continued and methods for reducing erosion have been investigated. Preliminary results with an experimental ignition system employing the surface-discharge type of plug are encouraging. Research at Cambridge on the hydrogen-oxygen fuel cell has been brought to a close, the work having reached a state at which engineering development might be attempted, and the National Research Development Corporation has the project in hand.

In the field of welding the self-adjusting welding arc and welding process have been shown to be very sensitive to changes in electrical parameters. Limits have been defined outside which weld quality deteriorates. Although at present limited to aluminium in an atmosphere of argon, the principles are applicable to other materials and gases.

Among unclassified researches there is a section on network analyser and system constants. Here, an extensive programme of full-scale tests on transient and steady state stability has been carried out in collaboration with the C.E.A. and various member firms. Tables detailing data required for system studies are in an advanced stage and the list of definitions prepared has already been published. The E.R.A. journal *Co-operative Electrical Research* has been successfully launched and provides yet another vehicle for giving to members and prospective members some idea of the work being done—reviewed in this case on very broad lines but in more detail than is possible within the limits of the annual report. The effort devoted to exhibitions has also played an important part to the same end.

Collaboration on Automation

BECAUSE of the rapid growth of the new industrial techniques known as automation, which also comprise computation, process control and data processing generally, and of the many persons likely to be affected by their application, consideration has been given to the establishment of some central organisation to afford liaison between all the interested bodies. At the invitation of the Institutions of Civil, Mechanical and Electrical Engineers, exploratory conferences were held on 6th March and 16th April, as a result of which the representatives of some twenty organisations with interests in the fields of automation and computation approved proposals for closer collaboration, and agreed to recommend them to their Councils for adoption. There was unanimous agreement that the setting up of a new and all-embracing society concerned with automation was not required, but that great advantage would ensue from the measures of collaboration proposed, it being fully recognised that, in the framework of automation, the importance of the human side is equal to, if not greater than, that of the purely technological aspects.

The proposals, if accepted by the bodies concerned, will result in the setting up of a British Conference on Automation and Computation which will be organised in three groups of societies, having the following fields of interest: Group A—Engineering applications of automation techniques. Group B—The development and applications of computers, automatic controls and programming techniques. Group C—The sociological and economic aspects of automation and computation procedures.

The following bodies would be invited to act as the conveners and sponsors:—Group A—Convener: Institution of Mechanical Engineers. Additional sponsors: Institutions of Civil, Chemical, Electrical and Production Engineers. Group B—Convener: Institution of Electrical Engineers. Additional sponsors: Institute of Cost and Works Accountants, Institute of Physics, Office Management Association and Society of Instrument Technology. Group C—Convener: British Institute of Management. Additional sponsors: Industrial Welfare Society, Institute of Cost and Works Accountants, Institute of Personnel Management and Institution of Production Engineers.

If the proposals are approved by the Councils of the several societies represented at the exploratory conference, the conveners and sponsors of each Group will summon further meetings, to which will be invited representatives of all the bodies which appear to have interests in the particular Group, with a view to their membership and collaboration.

As has been indicated above, all societies and institutions interested in the subject will be most welcome to support the activities of the Conference by applying for membership of the appropriate Group or Groups.

TRANSMISSION AT 400 kV IN RUSSIA

Lecture to I.E.E. Supply Section

IN a lecture delivered to the Supply Section of the Institution of Electrical Engineers last week by Mr. B. P. Lebedev on behalf of Mr. S. S. Rokotyan (chief engineer, Department of Long Distance Electric Power Transmission, U.S.S.R.) particulars were given of 400 kV systems, existing and planned, in the Soviet Union.

The first stage of the scheme was described as providing for the development by 1960 of a consolidated power system in the European sector of 30,000 MW capacity. This would entail the construction of 5,000 km of 400 kV three-phase lines with 17 substations and 500 km of 800 kV d.c. lines. A second stage, in which the capacity would be increased to 50,000 or 60,000 MW, envisaged the addition by 1965 of 6,000 to 7,000 km of 400 kV lines and 25 substations. During the same period it was proposed to interconnect as one 400 kV system power stations in Irkutsch and adjoining districts in the Asiatic sector.

Because of the constructional difficulties associated with double-circuit lines only the two most heavily loaded would be so designed. These were the Kuibishev-Moscow connection of over 800 km, one circuit of which was put into service in April, 1956, and the other in December, 1956, and the Stalingrad-Moscow 1,000 km connection, which was due for commissioning in 1958-59. Single circuits were proposed for transmission of less than 1,000 MW from Kuibishev to the Urals (1,050 km), from Stalingrad to Donbas (500 km by d.c. at $\pm$400 kV) and for a Moscow ring (215 km).

Equipment for Parallel Operation

Means of securing stability in parallel operation of power stations at great distances apart included high-speed electronic excitation, reduced reactance of transformers and use of step-down auto-transformers, switching stations at every 200 to 250 km containing synchronous condensers and series capacity compensation of 25 to 33 per cent. Circuit-breakers were of the air-blast type (2,000 A and 10,000 and 15,000 MVA interrupting capacity) and cleared faults within a total time of 0·10 to 0·12 sec. Tests on 117 to 815 km sections of the Kuibishev-Moscow line had proved the feasibility of automatic reclosure of 400 kV lines up to 500 km.

Resistors at the 400 kV busbars of large hydro-electric stations were automatically switched in to brake the generators if the load suddenly dropped. Self-synchronising tests at the Kuibishev hydro-electric station showed that at less than 50 per cent load the generators fell into step instantaneously and for higher loads in up to 17 sec; current surges never exceeded 300 per cent of rating.

Shunt reactors (single-phase rating 50 MVA), which regulated transmission voltage and flow of reactive power by varying the numbers connected, were installed to reduce line losses and the internal over-voltage level, which did not exceed three times the peak-phase voltage. Insulation levels were determined by neutral earthing on the 400 kV side of transformers, by lightning protection along the entire transmission route by two earth wires, giving a protection angle of 15 to 20 deg, and installing divertors at substations, and by keeping earth resistance of towers within 10 ohms in normal soils.

Bundle conductors, three per phase of 400 and 480 sq mm each, were run in equilateral formation. The height of towers up to the insulators was 27 metres and the most economical span was 400 metres. To reduce the mechanical loading of towers and foundations, the cross-sectional-area ratio of steel to aluminium had been reduced to 1 to 8 from the 1 to 4·4 and 1 to 5·1 used for 110 kV and 220 kV lines; the safety factor was not less than 2·75. Forces on suspension towers, which had 20 to 22 insulators per string and formed 90 per cent of the total number, were calculated only on the basis of all conductors being intact. Rupture had usually been provided against by releasing clamps, which necessitated using strain towers at every 7 to 10 km. A new experimental design, using slipping clamps which had a limited holding strength so that broken conductors did not fall to the ground, enabled strain towers to be eliminated; the saving in cost of tower metal would be 3 to 4 per cent and of insulators 20 per cent.

Step-up transformers were connected in delta-Y-Y in three-phase groups of $3\times123{\cdot}5$ MVA and were water-cooled with forced-oil circulation. Step-down transformers and auto-transformers were all air cooled and were either of 3×90 or 3×167 MVA.

On the Kuibishev-Moscow line 800 MW had been transmitted over the two circuits without series capacitor compensation and with only standard methods of generator excitation. The steady-state stability limit for one circuit at 420 kV was 560 to 580 MW. Maximum corona losses measured during hoar frosts amounted to 16 kW/km for three phases and in clear weather to 3 kW/km. Investigations in hand included problems of converting the 400 kV a.c. lines now in service to 500 kV and of designing equipment for 600 or 750 kV operation.

Flexible Insulating Sleeving

A NEW British Standard for flexible insulating sleeving (B.S. 2848:1957, price 6s from the British Standards Institution, 2, Park Street, London, W.1) is based on information supplied by the British Electrical and Allied Industries Research Association. It specifies requirements for a range of flexible insulating sleeving of circular section, intended primarily for insulating electrical conductors and the connections of electrical apparatus. The sleeving may be made by varnishing or coating a textile base, or by extruding suitable insulating materials, with or without a textile base.

Some of the types of sleeving dealt with in the Standard (especially the larger sizes) are also suitable for covering and holding together a number of conductors which are already individually insulated. In selecting the most suitable sleeving for a particular purpose, consideration should be given to such general factors as operating temperature range, electrical requirements, climatic conditions, degree of fire resistance and the need for mechanical reinforcement, i.e. external braid. Tests for all these factors are dealt with in appendices to the Standard. Other considerations to be borne in mind are the possible effects of impregnating media and of oil and other liquids with which the sleeving may come into contact.

OVERSEAS ELECTRICAL TRADE

EXPORTS ADVANCE IN FIRST QUARTER OF 1957

DESPITE the disputes in the shipbuilding and engineering industries last month the upward trend in electrical exports continued and the total of £20·2 million was nearly £1,000,000 better than the figure for February, and as compared with the corresponding month of 1956 showed a rise of over £3,000,000. For the first three months of this year the total was £56·6 million, as compared with £52·9 million for January-March, 1956. Practically all classes shared in the improvement, an exception being the converting machinery, mercury arc rectifiers, transformers, etc. group, which showed a slight fall from the February figures of £2,793,463 to £2,560,884.

Under the heading of generating sets, generators and motors, the total exports for March were valued at £3,374,045, as compared with £2,742,486 in February.

TABLE I.—ELECTRICAL EXPORTS

Class	March 1957	Three months ended March 1956	Three months ended March 1957
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	212,966	366,929	470,536
Ditto, 10 to 65 kW	208,884	336,753	475,703
Ditto, 65 to 200 kW	121,079	361,708	301,956
Ditto, over 200 kW	265,062	933,505	940,894 *
Spark ignition engine driven	21,686	127,560	44,219
Steam turbine driven	143,975	71,023	189,183
Hydraulic turbine driven	—	51,786	—
Other prime mover driven	11,043	96,732	38,894
Generators, not exceeding 200 kW	183,595	408,168	494,814
Ditto, over 200 kW	68,951	229,932	245,175
Parts of generators	670,664	1,866,464	1,303,100
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	214,908	600,938	580,037
Over ½ but under 1 h.p.	52,694	177,170	154,713
1 h.p. to 250 h.p.	535,098	1,325,283	1,539,186
Over 250 h.p.	96,327	167,370	345,501
Railway, tramway and trolley-bus motors complete and parts of all motors	169,738	530,499	481,857
Motor starting and controlling gear	397,375	711,895	963,323
	3,374,045	8,363,715	8,569,091
Converting machinery	33,884	101,805	200,913
Mercury-arc rectifiers	59,048	211,243	115,998
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	714,116	3,094,734	1,844,884
Over 7,500 kVA	365,197		753,720
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	313,945	730,292	930,600
Ditto, other	1,074,694	3,470,868	3,420,376
	2,560,884	7,608,942	7,266,491
Primary batteries:			
Lighting	114,464	205,651	306,622
Radio	322,368	714,964	914,884
Other	46,696	139,414	139,114
Parts (excl. carbons)	60,851	128,093	159,117
Lamps:			
Filament, exceeding 28 V*	92,193	304,865	255,786
Ditto, under 28 V*	33,913	94,737	108,008
Arc lamps and searchlights	20,461	60,095	42,951
Discharge lamps, fluorescent tubes, etc.	114,662	223,810	326,894
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	32,459	70,672	82,853
All other	299,137	583,013	850,541
Parts (excluding glass bulbs)	12,776	53,116	31,001
Radio and television transmitters	48,318	212,709	242,659
Commercial radio and radar equipment	1,328,501	3,416,563	3,731,390
Domestic radio receivers, mains	175,602	488,491	371,713
Ditto, battery	78,687	234,944	180,085
Ditto, other (incl. car)	32,957	86,640	80,111
Radiograms	32,265	105,739	81,455
Television sets	77,897	139,413	189,924
Public address equipment	113,433	263,564	309,829
Other radio and television apparatus, n.e.s.	62,838	109,432	189,495
Components and parts, n.e.s.	765,515	1,953,737	2,378,335
	3,060,385	7,718,033	8,719,391
Telegraph and telephone installations	538,533	1,838,802	1,951,044
Telephone instruments, separately consigned	253,203	351,509	558,263
Telegraph and telephone parts	943,570	1,706,288	2,613,413
Line apparatus for long distance commun.	71,972	344,014	252,454
	1,807,278	4,240,613	5,375,174

Class	March 1957	Three months ended March 1956	Three months ended March 1957
	£	£	£
Cookers	77,182	270,928	209,715
Toasters	17,798	65,745	43,273
Other cooking apparatus	34,047	110,312	96,219
Parts and accessories	77,245	252,308	221,263
Space heating appliances	39,409	156,034	117,254
Water heating appliances	38,675	97,639	92,448
Other heating appliances	53,434	117,328	128,530
Parts and accessories	54,462	201,785	187,341
Irons	78,088	341,408	192,693
Arc welding equipment, a.c.	61,378	182,723	184,505
Ditto, d.c.	52,387	121,481	159,829
Resistance welding equipment	44,702	62,255	79,542
Electric furnace plant	128,205	169,059	323,040
Magnetos, ignition	21,922	89,335	96,779
Sparking plugs	129,466	470,586	471,347
Elec. appliances for aeroplanes, n.e.s.	272,799	553,362	773,669
Ditto, for motor vehicles, n.e.s.	387,322	1,05'8 6	1,103,846
Ditto, for cycles, n.e.s.	57,343	245,729	150,799
Signalling app. (inc. traffic signals)	152,453	173,119	335,722
Instruments, commercial	185,374	526,0'8	550,6'8
House service meters (including parts)	208,382	540,931	566,059
Electro-medical apparatus (not X-ray)	42,412	130,403	101,349
X-ray apparatus (excl. tubes and valves)	66,597	206,426	192,041
Vacuum tubes	33,561	73,334	139,056
Ceiling fans, complete	105,982	301,733	320,930
Desk fans, complete and parts of desk and ceiling fans	36,251	80,247	106,132
Vacuum cleaners	170,829	396,429	487,115
Floor polishers	103,062	256,986	250,059
Food mixers	36,226	185,471	138,103
Hair clippers and dry shavers	53,557	270,091	255,731
Other portable appliances	31,766	87,872	88,044
Parts	129,927	366,340	377,955
Portable elec. tools (not saws) and parts	207,691	577,802	667,588
Cables and wires:			
Telegraph and telephone, submarine	12,508	103,317	110,580
Ditto, other	1,242,822	2,376,308	3,138,821
Cotton, silk or art. silk insulated	52,121	186,345	133,441
Enamel, glass or asbestos insulated	106,879	232,524	303,804
Paper insulated	986,423	3,187,'51	2,391,996
Rubber insulated	486,744	1,534,842	1,745,580
Thermoplastic insulated	164,692	404,426	461,466
Other	258,154	693,978	637,806
	3,310,343	8,718,891	8,923,494
Accumulators for motor vehicles	140,819	557,762	432,818
Ditto, traction	22,099	70,005	84,967
Ditto, radio and other portable	103,001	250,031	266,313
Ditto, other	32,602	162,531	86,710
Parts and accessories	70,667	257,268	283,176
Elec. porcelain, etc. (incl. insulators), n.e.s.	125,611	306,045	344,719
Insulating cloth and tape	55,216	201,200	187,880
Other insulating material	87,700	270,784	282,098
Permanent magnets	61,825	130,431	145,134
Radio, telegraph and telephone testing equipment, n.e.s.	55,018	91,320	176,059
Scientific elec. instruments (not telegraphic or telephonic):			
Time recorders and time switches, complete	10,380	36,184	29,167
Other	288,341	596,703	941,328
Electrical machinery, n.e.s.	74,850	361,969	210,331
Electrical apparatus and appliances, n.e.s.	978,038	2,299,352	2,773,905
TOTAL	20,214,644	52,911,443	56,560,216

* The figures for 1957 are not completely comparable with those for previous years

TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	March 1957	Three months ended March 1956	Three months ended March 1957	Country	March 1957	Three months ended March 1956	Three months ended March 1957
	£	£	£		£	£	£
Channel Islands	80,062	228,861	302,235	Netherlands	733,024	1,713,813	2,113,655
Gibraltar	14,557	43,057	33,698	Belgium	310,002	847,884	977,293
Malta and Gozo	64,470	242,149	141,567	France	372,319	918,520	1,268,456
Cyprus	156,996	457,275	417,267	Switzerland	140,391	288,446	378,130
Sierra Leone	28,618	83,264	90,362	Portugal	338,747	470,372	768,754
Gold Coast	161,266	472,643	507,658	Spain	362,759	500,496	1,102,346
Nigeria	260,184	940,013	853,946	Italy	434,183	947,620	947,076
Union of South Africa	1,504,344	4,206,442	4,391,445	Austria	49,233	139,691	95,310
Rhodesia and Nyasaland	553,499	1,783,255	1,564,019	Yugoslavia	81,133	252,507	186,320
Tanganyika	81,609	174,221	199,724	Greece	329,884	471,547	525,603
Kenya	294,928	636,621	835,563	Turkey	50,958	267,092	176,120
Uganda	90,817	207,691	295,828	Belgian Congo	57,505	101,821	138,433
Mauritius	19,046	75,551	105,190	Portuguese East Africa	46,524	73,830	94,596
Aden	61,785	168,350	168,111	Egypt	223	538,334	816
Bahrain, Qatar and Trucial States	117,290	281,793	492,563	Libya	75,324	57,146	124,193
Kuwait	100,468	275,628	609,285	Southern Morocco	10,214	138,920	134,702
India	2,180,194	5,158,939	6,389,667	Sudan	42,342	179,201	319,723
Pakistan	481,883	842,056	951,434	Syria	49,502	129,112	117,539
Singapore	298,714	861,200	968,673	Lebanon	42,788	147,067	103,503
Federation of Malaya	302,992	821,662	987,126	Israel	30,923	185,980	194,612
Ceylon	147,471	434,940	491,364	Jordan	90,755	167,891	183,682
British North Borneo	20,188	105,925	68,359	Saudi Arabia	95,555	257,739	162,654
Sarawak	9,695	63,619	48,105	Iraq	373,112	992,754	823,405
Hong Kong	224,370	558,809	710,864	Iran	549,047	621,479	924,599
Australia	1,631,407	5,292,096	4,861,777	Burma	27,711	496,086	152,029
New Zealand	1,149,345	2,757,425	3,111,892	Thailand	94,144	346,041	260,372
Fiji	24,567	51,774	62,875	Indonesia	64,668	154,438	183,390
Canada	1,094,647	2,283,801	2,891,232	Japan	116,553	152,365	232,995
Jamaica	99,391	343,776	257,428	United States of America	980,522	2,318,165	2,317,488
Barbados	20,269	109,129	64,368	Cuba	59,522	93,716	120,346
Trinidad	133,110	355,693	360,789	Mexico	51,949	186,318	166,188
British Guiana	52,024	124,469	133,408	Colombia	50,624	314,861	134,724
Other Commonwealth countries	179,644	238,741	366,779	Venezuela	296,713	1,015,238	888,600
Irish Republic	212,506	903,291	641,723	Peru	105,863	131,262	203,481
Soviet Union	160,870	812,236	533,098	Chile	40,272	65,583	128,941
Finland	71,142	425,541	286,326	Brazil	73,946	705,604	232,063
Sweden	320,106	947,064	1,017,487	Uruguay	29,410	26,528	69,912
Norway	180,900	593,038	613,919	Argentine Republic	145,398	183,606	299,236
Iceland	17,385	42,626	30,948	Other foreign countries	342,341	778,970	1,057,274
Denmark	254,713	503,013	631,024				
Poland	22,668	98,786	108,917	TOTAL	20,214,644	52,911,443	56,560,216
Western Germany	188,421	526,937	653,614				

Australia took the lead from India as the most important market, taking plant valued at £505,490, Canada occupying second place with purchases of £420,552. India's share was £253,915, while South Africa came fourth with £240,838. The principal market for converting machinery, mercury arc rectifiers, transformers, etc., was India whose imports totalled £466,629 in value. South Africa took plant valued at £301,814, and New Zealand £198,615.

In the radio equipment group India bought apparatus valued at £266,765, Italy jumping to second place with purchases of £189,622. Third place was occupied by Australia with imports of £180,367. The three leading markets for telegraph and telephone equipment were New Zealand (£260,114), South Africa (£219,104) and Australia (£209,542).

By far the most important market for cables and wires was India which took supplies valued at £603,343. The United States also made substantial purchases, amounting to £413,873, and equipment valued at £218,393 was exported to New Zealand.

Details of the imports in the various categories are given in Table I, and Table II shows their distribution. The Board of Trade returns list a number of electrical items not included in the classes shown in Table I. These include the following:—

Electrically operated washing machines, complete, not exceeding 150 lb net weight: March, £296,448; three months, £947,372; ditto, 150-250 lb net weight: March, £113,823; three months, £320,753. Parts: March, £48,496; three months, £177,286.

Electric carbons, including parts: March, £64,168; three months, £175,853.

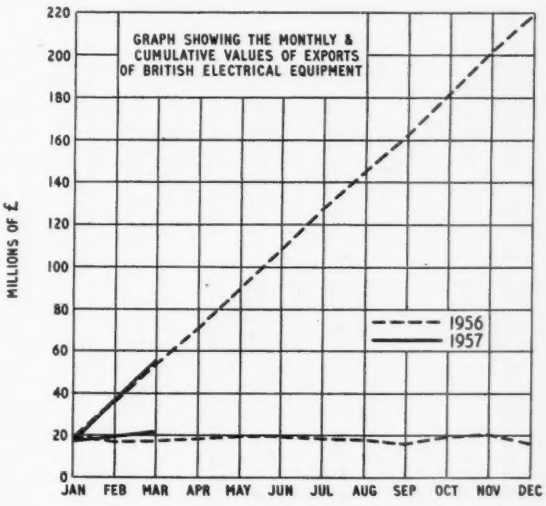
Welding electrodes (excluding carbon), covered: March, £120,131; three months, £362,116.

Electric conduit tubes and cased tubes: March, £107,812; three months, £284,657.

Electric locomotives: March, £292,907; three months, £932,904. I.c. locomotives with electrical transmission: no figure is given for March, but the total for three months is shown as £325,062.

Electrical Imports

Imports of electrical machinery and apparatus and appliances continued to decline, the total for March being £1,865,761 as compared with £1,973,027 in February. The total value of imports for the first quarter of this year was £6,092,577, as compared with £6,146,181 for the corresponding period of 1956. The three leading suppliers were the United States (£485,549), Western Germany (£349,649), and the Netherlands (£305,963). Radio and associated equipment continued as the principal class of imports.



BRITISH INDUSTRIES FAIR

PREVIEW OF THE EXHIBITS AT CASTLE BROMWICH, BIRMINGHAM

LAST year the Electrical Section of the British Industries Fair was moved to London from Castle Bromwich, Birmingham, where it had been for many years. With the closing down of the London Section of the Fair the electrical exhibitors (as a body) were disinclined to return to Birmingham and there is now no officially-backed Electrical Section. But although the leading concerns in the industry no longer participate in the Fair there are still a number of electrical companies represented at Castle Bromwich where the Fair is being held from Monday next, 6th May, until the 17th; these, with the other firms who show electrical or allied equipment, raise the number of exhibitors of interest to our readers up to about seventy.

In general, it is the lighter side of the industry which is represented with exhibits such as clocks, instruments, lighting fittings, heating appliances, domestic equipment, etc. It is anticipated by the organisers, the Birmingham Chamber of Commerce, that over sixty countries will be sending representatives to the Fair, the thirty-eighth in the series.

Buyers representing United Kingdom firms will be admitted to the Fair every weekday from 9.30 a.m. to 6 p.m. except on the last day when closing time will be 4 p.m. Overseas buyers are admitted free. Home buyers can for 2s 6d obtain badges which will admit them for the duration of the Fair. The public is admitted each day after 2 p.m. and all day on Saturday, 11th May, at a cost of 2s 6d. On this Saturday organised parties of twenty or more will be admitted for 1s 6d per head.

Special travel arrangements are being made by British Railways and during the period of the Fair a special train will leave Euston daily at 8.55 a.m. for Castle Bromwich. It will leave the Fair at 5.10 p.m. and arrive back at Euston at 7.48 p.m. A shuttle bus service, between the Fair and City Centre, will also be in operation.

GUIDE TO THE EXHIBITS

Accles & Shelvoke, Ltd., Talford Street Works, Aston, Birmingham, 6. —**Stand D.317.**—The "Acvoke" cable spiking gun is a remotely controlled cartridge operated device which will "spike" all types of cable including single or double heavy wire or steel tape armoured types. These guns have already been adopted as standard equipment by the C.E.A., and more than 200 are now in service.

W. & T. Avery, Ltd., Soho Foundry, Birmingham, 40.—**Stand D.523/D.420.** —Weighing, counting and testing machines exhibited include a drum filling scale with automatic tare compensation and dial indication. The incorporation of an electronic switch permits push-button control throughout. Batch-weighing is exemplified in a new adaptable electronic scale for the accurate blending by weight of granular materials, dry powders, etc. An electro-dynamic balancing machine of 600 lb capacity, for shaft and belt drive, with suspended bearings and electronic phasing, is also shown.

Belliss & Morcom, Ltd., Ledsam Street Works, Birmingham, 16.—**Stand D.315/D.212.**—Among the oil-engine exhibits is a 6-cylinder model of the vertical single-acting 4-cycle type developing 1,140 b.h.p. continuously (750/800 kW depending on site conditions and generator efficiencies). In addition the company has on show a 645 cu ft air compressor suitable for motor drive, as well as an instructional steam turbine, coupled to a dynamometer, that has been specifically designed for experimental work at universities and technical colleges.

British Electrical Development Association, 2, Savoy Hill, London, W.C.2. —**Stand C.408/C.509.**—A wide selection of examples of the use of electric heat in industry, many in actual operation, are to be seen on this stand organised jointly by E.D.A. and the Midlands Electricity Board. These include resistance, dielectric and induction heating as applied to industrial processes, glass tube bending, ceramic tile drying, paint drying, timber seasoning, die-casting and metal melting. Another section is devoted to the heating of factories by floor warming installations, off-peak block storage heaters and overhead infra-red heaters. A display entitled "Consider Electric Heating Now" stresses that atomic power will eventually make electricity indispensable for industrial heating processes. Attention is drawn to the Midlands Board's research services to industry with examples of "case histories" on how electricity has solved various industrial problems.

British Vacuum Cleaner & Engineering Co., Ltd., Goblin Works, Leatherhead, Surrey.—**Stand A.322.**—Among "Goblin" domestic appliances shown are four different types of vacuum cleaners, including a powerful de luxe model (G.56) with 500 W motor and multi-stage fan; a range of washing machines; and three models of the "Teasmade" tea making appliances. On Stand C.411/C.310 the company displays a large range of portable industrial cleaners. B.V.C. machines are also available for extraction, reclamation, removal of dust, light materials or even liquids.

Brook Motors, Ltd., Empress Works, Huddersfield.—**Stand C.615/C.514.**—Two recently introduced motors interchangeable with the existing range are a fan-cooled slip-ring machine with internal rings, and a crane motor of either cage or slip-ring types. The single-phase "Power Pack," consisting of protected or fan-cooled motor with either hand-operated or automatic push-button starter, is also shown. The millionth "Gryphon" is a special feature and there is also a wide variety of motors in many types and enclosures. The smaller size B.S.42 range and the recently introduced "Merlin" domestic appliance motor are represented. Control gear will cover hand-operated and automatic push-button starters, and a comprehensive range of push-button stations and limit switches.

Alfred Bullows & Sons, Ltd., Long Street, Walsall, Staffs.—**Stand D.743/D.642.**—This company is showing a complete range of stationary and portable "Hydrovano" compressors, both engine and electrically driven, with a capacity ranging from 3 c.f.m. to 250 c.f.m. per unit. There is also a new version of the PR303 portable spray painting plant, spray guns and spray painting equipment.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—**Stand A.417/A.318.**—"Swan" Brand domestic electrical appliances include kettles, coffee percolators, fires, toasters, urns, wash boilers and blankets. There are also ground base aluminium holloware for electric heat and storage cookers, and immersion elements.

C.A.V., Ltd., Acton, W.3.—**Stand C.501.**—Generators exhibited include 5½ and 7in dia models, one type being fireproof. A 5½in motor for a special industrial drive is shown. Starters include the 6in axial type, and a 7in type with inertia-engaged pinion and two-stage solenoid switch operation suitable for starting transport, marine and heavy industrial engines. Among other products displayed are control boards for use with generators of both compensated voltage and current-voltage type control and a completely waterproof 60 W searchlight, specially designed for marine use.

W. Canning & Co., Ltd., Great Hampton Street, Birmingham, 18.—**Stand D.207/D.106.**—The exhibit of main interest is a "Submatic" barrel plating unit, a semi-automatic plant of the fully submerged barrel type for processing batch outputs of mass produced repetition components. The installation consists of a line of tanks comprising cleaners, rinses and processing solutions. An electric hoist runs the length of the line and this is used to raise, lower, and transfer the barrels from one tank to another. While in position in the tanks the barrels rotate, rotation at each position being controlled by a hand-operated clutch.

Other products shown by the company are a "Minichrome" hard chrome plating unit; a "Minik" submerged barrel, now fitted with a self-emptying work tray; an "Aurax" gilding unit; a 7-8 gal bottom emptying centrifugal dryer; an automatic polishing unit; and a "Twin 1612" polishing motor. The last item has two 5 h.p. motors in tandem, each with independent control, giving the unit great flexibility in use.

C.J.R. Electrical & Electronic Development, Ltd., Bickford Road, Witton, Birmingham, 6.—**Stand D.713.**—Of special interest is a new sequence and slip controller for use on all types of conveyors. The unit consists of an a.c. tacho-generator which can either be direct coupled to the motor drive or coupled via a light V-belt drive, and a relay unit which has two controls, one for pre-setting the speed at which the relay operates and the other for varying the differential. A low speed magnetically operated sequence and slip controller with operating speeds from 7½ to 15 and 15 to 30 r.p.m.; the "C.J.R." portable tool safety system; a range of safety transformers; industrial control magnetic amplifiers; and transductors are also shown.

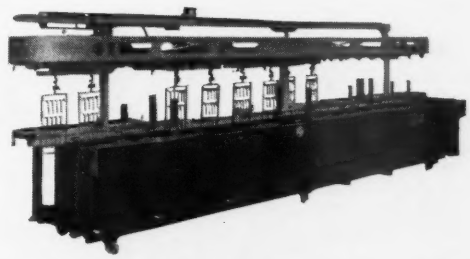
Dawson, McDonald & Dawson, Ltd., Compton Works, Ashbourne.—**Stand C.713.**—Various types of diaphragm air compressors and vacuum pumps are displayed in addition to spray equipment. Compton Castings, Ltd., an associate company, exhibit gravity die castings and sand castings in aluminium.

Delta Metal Co., Ltd., Delta Works, East Greenwich, London, S.E.10.—**Stand D.313/D.210.**—Specially shaped extruded bars in brass, bronze and copper. The Plastics Division exhibits the new "Deltathene" high strength super polythene pipe for agricultural, domestic and industrial supply lines.

Donovan Electrical Co., Ltd., Granville Street, Birmingham, 1.—**Stand C.722.**—Motor control gear includes a range of direct-on-line starters up to 75 h.p. (with the new improved pattern of size 0, up to 3 h.p.), star-delta and resistance starters of various patterns, small power relays, latched relays and larger contactors up to 300 A. A comprehensive selection of accessories includes push-buttons, limit and other remote control switches, and terminal blocks. There is also a range of "Donlok," "Safuse" and "Scrutact" switch and fuse gear, while among specialities on view are "Donlok" power switch-sockets and interlocked plugs (up to 100 A 3-phase); "Donlok" trolley wire safety switches; "Reylovolt" l.v. lighting transformers; and "Runtact" power duct.

Easiclene Porcelain Enamel (1938), Ltd., P.O. Box 10, Darlaston, Wednesbury, Staffs.—**Stand B.522.**—A new domestic air steriliser, shown for the first time, is constructed of pressed aluminium and the specially treated interior has high ultra-violet reflective properties. It is 3ft 9in in length and can be placed in any convenient position or fixed to a wall or ceiling. A new 4·25 cu ft refrigerator and two new wash boilers, of 6 and 10 gal capacity respectively, are also exhibited.

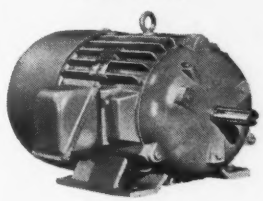
Electric Depot, Ltd.—Pritchett Street, Birmingham, 6.—**Stand C.707.**—Adjustable local lighting fittings for all industrial applications include the

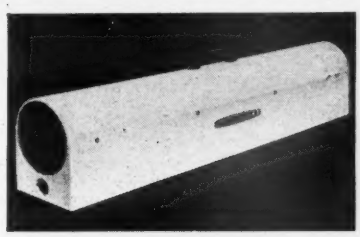


"Efco-Udylite" junior fully automatic plating machine (Electro-Chemical Engineering Co., Ltd.)

Easiclene electric domestic air steriliser

B.S. fan-cooled motor fitted with internal slip-rings (Brook Motors, Ltd.)





dual-purpose "Lens-Lite" which combines illumination with magnification. Cable racks and hangers for supporting power cables are other specialities.

Electrix, Ltd., Sterling Works, Dagenham, Essex.—**Stand D.528.**—Vacuum cleaners with stair skids, floor polishers and spraying equipment.

Electro-Chemical Engineering Co., Ltd., Sheerwater, Woking, Surrey.—**Stand C.609.**—The principal exhibit on this stand is an "Efco-Udylite" junior fully automatic plating plant, which is seen in operation. This particular machine has been designed for bright cadmium plating followed by passivation. The company's metal cleaning division shows a small "Efco Agidip" machine consisting of a cabinet into which parts to be cleaned are placed and moved up and down pneumatically through a "Di-phase" emulsion cleaning solution. Another display is devoted to a practical demonstration of the use of "Zero-Mist" in chromium plating.

Electromagnets, Ltd., Boxmag Works, Bond Street, Hockley, Birmingham, 19.—**Stand C.605.**—Among the products shown are rectangular and circular lifting magnets with "select-o-load" control; swarf separators; magnetic conveyor heads; overband separators; magnetic clutches; floor sweepers; filters, sand separators; and permanent magnets.

George Ellison, Ltd., Perry Barr, Birmingham, 22B.—**Stand C.617/516.**—In addition to a wide range of electric switchgear there is a selection of hydraulic valves that are particularly suitable for an inexpensive, yet effective, form of automation. The recently introduced "Geo" range of switchgear comprises horizontally isolated draw-out circuit-breakers, A.S.T.A. tested to B.S. 116:1956, for service voltages of up to 660 and with current carrying capacities of 400, 600, 800, and 1,200 A. Circuit-breakers and motor starters include a 20 A direct-to-line starter with integral isolator and back-up fuses, A.S.T.A. tested to B.S. 936 : 1940. Emergency trip switches, suitable for voltages of up to 660 and having a rating of 5 A continuously, and a range of tappet operated shunt and series limit switches for a.c. and d.c. are also displayed.

Explosive Power Tools, Ltd., Hope Street, Dukinfield, Cheshire.—**Stand B.308.**—A new British-made cartridge operated fixing tool is shown. This R.7 breech loaded ¼in model is the latest addition to the "Rapid Hammer" range of tools and can be safely operated with one hand from a ladder. Its length is 12in and it weighs 6 lb. Extension barrels can be supplied in sizes from 1 to 3in.

Fescol, Ltd., North Road, London, N.7.—**Stand D.529.**—The latest development of the "Fescol" process, a deposition of hard chromium on components up to 5ft in diameter and 6 tons in weight, is shown. Other exhibits are arranged to demonstrate the wide facilities available at the company's plants throughout the country.

Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, Hendon, N.W.9.—**Stand C.721.**—On display is a comprehensive range of a.c./d.c. shunt, split-phase, three-phase, capacitor, synchronous and shaded pole motors, ranging from 1/250 h.p. to ½ h.p., and geared units of 0·125 to 600 r.p.m.

Hadley Telephone & Sound Systems, Ltd., 72, Cape Hill, Smethwick, Birmingham.—**Stand C.712.**—Included in this display are the company's industrial sound unit, a compact instrument which provides for staff location, personal broadcast messages, time and alarm signals, etc.; the "Multicom," claimed to be the only equipment of its kind providing direct loudspeaking or telephone contact between all points up to a maximum of 20; and the "Intercommunicator Mark III," in which either 6 or 12 extensions can be called without the necessity for switching on, though the privacy of each extension is preserved. A new electronic device which will greatly simplify colour printing processes is shown for the first time. A considerable saving in time and cost is claimed for the "H.P.K. Autoscan," a reproduction camera with electronically controlled light output for scanning coloured copy and producing colour and tone corrected separation negatives.

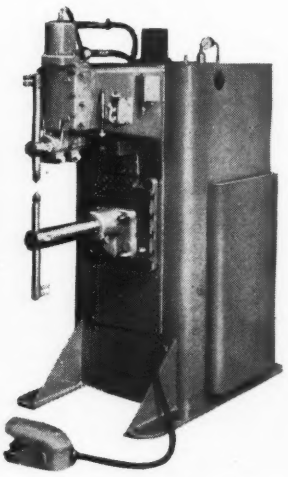
Hadrill & Horstmann, Ltd., Oak Lane, East Finchley, London, N.2.—**Stand A.425.**—Counterpoised lamps for domestic and industrial purposes.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, London, W.C.2.—**Stand C.403.**—Products displayed include convector heaters in six different colours; automatic tea-making sets; "Hostess" electrically heated dinner wagons; a range of safe electric fires; hair dryers; a home hair dryer hood attachment; the "El-boilo" rapid liquid heater; and kettles, lanterns, irons, toasters, and pressure cookers.

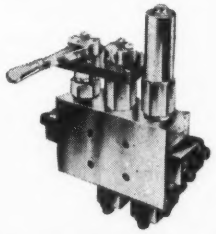
Alfred Herbert, Ltd., P.O. Box No. 18, Red Lane Works, Coventry.—**Stand D.314.**—On this stand may be seen the new "Daniels/Latymer" machine which is capable of forming plastic sheets by vacuum, utilising materials ranging from cellulose acetate foils 0·005in thick, for transparent packs, etc., up to p.v.c. laminates and high impact polystyrenes of 0·120in for heavy components, such as refrigerator door liners, etc. Another exhibit is the Sigma "Superset" electrical comparator, a highly accurate instrument designed for work such as the calibration of gauge blocks, where the accuracy required must be within a few millionths of an inch.

Higgs Motors, Ltd., Witton, Birmingham, 6.—**Stand C.601.**—Attention is drawn to the company's range of machines built to the new draft for 3-phase motors with ventilated enclosures, CW (ELE) 6246. A new range of motors includes split-phase, capacitor start, repulsion induction single-phase types together with polyphase and d.c. machines. Among other exhibits are 3-phase variable speed motors; a full range of geared motor units, in which new developments have been made; standard industrial motors and generators, including flange and vertical mounting types, stator and rotor units, and loom and polishing motors.

Holden & Hunt, Ltd., Cox's Lane Works, Old Hill, Staffs.—**Stand C.620/C.719.**—Besides a range of some 15 electric resistance welding and heating machines, including pedal operated spot welders from 5 to 25 kVA, an air operated spot welder of 50 kVA, and a 75 kVA spot/projection welder, there are auto butt wire welding machines

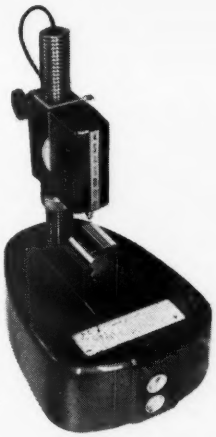


Holden & Hunt 50 kVA spot welding machine



Ellison 3-way single handle hydraulic valve with auto change-over unit for use with two pressures

Explosive Power Tools model R.7 cartridge operated fixing tool



Sigma "Superset" electrical comparator (Alfred Herbert, Ltd.)

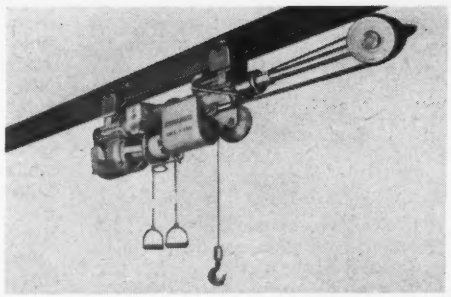
from 3 to 30 kVA, a No. 5 flash butt welder having a welding capacity of 1 sq in, and resistance rivet heaters, together with a range of "Scadcu" electrode tips.

Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1.—**Stand D.413/D.312.**—Copper and aluminium wire for cables, instruments and radio circuits are among items of interest to the electrical industry. In this field the Metals Division also shows copper and aluminium alloy busbar and jointing compound; copper and brass tape and extrusions for switches, switchgear, fuse boxes and similar equipment.

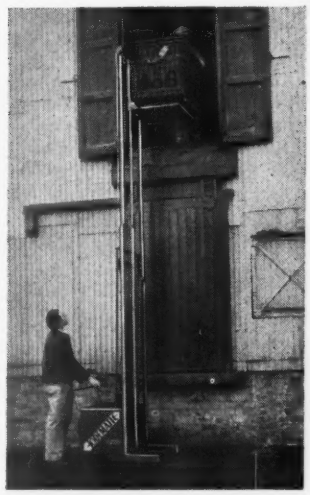
Industrial Guarding Equipment, Ltd., 42, Court Road, Birmingham, 12.—**Stand D.302.**—The "Pneumaster" electro-pneumatic press guard, shown for the first time, is a device that allows the full range of bending and forming to be carried out without interference to the operator. Another product shown is the latest "Auto-Cyclic" electronic control for interlocking guards on power presses. On Stand D.403 the Automation Division of the company displays several items of interest including injection brakes for a.c. motors, hydro-linear damping for air cylinders, electromagnetic clutches and various electrical and electronic controls.

Keith Blackman, Ltd., Mill Mead Road, London, N.17.—**Stand D.276.**—Fume removal fans, with solid p.v.c. casings and impellers, include a 6in model for laboratory use and a 10in bifurcated fan with divided casing and motor chamber isolated from the possibility of corrosive attack by chemical fumes. Among fans for general ventilation purposes on view is the 6in Type E.F.2 "Extravent" window fan for office or domestic ventilation.

Kenwood Manufacturing Co., Ltd., Old Woking, Surrey.—**Stand C.611.**—The company is showing its latest "Minor de-luxe" electric food mixer and the "Activair" fan heater, a combined heater air circulator with three different heat settings (2 kW, 1 kW and 500 W). Driven by a silent motor, the fan is operated by a separate switch which gives three different speeds. Other appliances include the "Chef" food mixer; the "Major," a larger mixer for restaurants and catering establishments; the "Minor"; the "Kenmix 55"; the "Roto-Blend"; and the "Steam-O-Matic" iron.



Lifting Gear Products "Hydrahoist" electro-hydraulic hoist



Lodematic 12ft electro-hydraulic stacker

Kleen-e-ze Brush Co., Ltd., Hanham, Bristol.—**Stand D.231.**—Exhibits include the "Kez" gun and bullets for condenser tube cleaning and the "Kam" unit for conveyor belt cleaning.

Lamb, Hingley & Co., Ltd., Stour Works, Lye, Stourbridge, Worcs.—**Stand A.433.**—The exhibits on this stand include a 2½ kW 10 gal electric clothes boiler with a new special cut-out and press button control and another new model with 3 kW element, cut-out and "Simmerstat" control.

Lifting Gear Products (Engineering), Ltd., Goliath Works, Petre Street, Sheffield, 4.—**Stand D.521.**—The new "Hydrahoist" electro-hydraulic wire rope hoist is designed to provide a trouble-free means of handling all types of load. It has a capacity ranging from 2½ cwt to 10 tons. The company's "Hydroist" 1-ton unit uses a 3½in bore ram with a stroke of 36in. The pressure of 1,200 lb/sq in is supplied by a 2½ gal/min geared pump direct coupled to a 3 h.p. motor. The variable speed and directional control is provided by means of a piston type control valve which also incorporates hydraulic locks and unloader valves.

Liverpool Electric Cable Co., Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.—**Stand C.717.**—Electric cables and flexibles (rubber, thermoplastic, paper and cambric insulated) for mines, quarries, railways, ships, and house wiring. "Lecupler" bolted flameproof cable couplers and electric vulcanisers (pressure type).

Lodematic, Ltd., Clitheroe, Lancashire.—**Stand D.738.**—Up to 12ft lift on platform or forks is obtainable in the new "Lodematic" range of electro-hydraulic automatic loaders and stackers, displayed on this stand. The hydraulic system is powered by an electric motor, and the new 12ft model, exhibited for the first time, is only 30in wide. It can be applied to such duties as inter-floor lifting, stacking and lorry loading. A smaller type is also available in six models from 4ft to 10ft lift.

London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.—**Stand C.717.**—Insulated electric wires, strips, and strands with cotton, silk, paper, asbestos, glass, enamel, "Lewmex" and "Lewkanex" coverings; fire resisting cords and flexibles; and copper braids and cords.

Joseph Lucas, Ltd., Great King Street, Birmingham, 19.—**Stand C.501.**—Electrical equipment for all types of transport including lighting, starting, ignition, batteries and other accessories for cars, commercial vehicles, motor cycles, cycles, agricultural tractors, stationary engines, etc.

Magicook Appliances, Ltd., 10-12, Shirland Mews, London, W.9.—**Stand C.503.**—Infra-red grills for domestic use shown include the "Magicook De-Luxe" model and the "Princess," For the catering trade there are the "Majestic" and "Savoy" infra-red grills. Another exhibit is the new "Espresso" electric home coffee machine.

Marris's, Ltd., Cumberland Street, Birmingham, 1.—**Stand A.330.**—An electric kettle, suitable for operation from a car battery and electrically lit shaving mirrors are shown.

Matthews & Yates, Ltd., Cyclone Works, Swinton, Manchester.—**Stand D.707.**—Representative examples of the "Cyclone" air conditioning, ventilating and dust collecting equipment comprising fans, air filters and heaters, etc., are displayed. Foremost among the fans is the low speed "Multivane" fan designed for air conditioning and ventilating installations. It is manufactured in three

ranges comprising 25 standard sizes; the volume of air handled varies from 150 to 176,000 cu ft/min. On show for the first time is the "Turbro-Cyclone" p.v.c. fan available in nine sizes and specially designed for all types of fume removal plants. Other exhibits include an axial-flow fan, an electric propeller fan for factory and workshop ventilation, and a unit heater for industrial space heating.

McKechnie Brothers, Ltd., Rotton Park Street, Birmingham, 16.—**Stand D.500.**—The copper powder display graphically illustrates the wide range of powders manufactured by the company for industrial purposes. Other examples of MKE products include extruded rods and sections in brass, bronze, nickel silver and copper, bronze welding rod, chill cast bars, anti-friction metals and non-ferrous ingots.

M.C.L. & Repetition, Ltd., Pool Lane, Langley, Birmingham.—**Stand D.515/D.414.**—Examples of the many repetition parts produced by the company for a wide variety of trades, including the motor, aircraft, radio and general electrical industries.

Midland Fan Co., Ltd., 212, Aston Road, Birmingham, 6.—**Stand D.712.**—Water wash spray booth; propeller fans; paddle blade and high pressure blower fans; compressor sets; spray guns; air filters and reducing valves.

Moss Gear Co., Ltd., Tyburn, Birmingham, 24.—**Stand D.428.**—A comprehensive range of geared transmission units includes standard type fan-cooled worm gear reduction units; vertical type worm gear units; geared motors; single and double helical type gear units; and gearing for lift mechanism.

New Welbeck, Ltd., Moulsecoomb Way, Brighton, 7.—**Stand C.208.**—A special feature of the industrial vacuum cleaners displayed and demonstrated by this company is that there is no dust bag, all dirt passing into a metal container. There are "Simplex" (single motor), "Duplex" (twin motors) and "Triplex" (three motors) machines to suit individual requirements. Containers are supplied in various sizes for all models, a special "Bak-Vak" canister with harness being available for use in cleaning beams, girders, etc.

Nutt Engineering Co., Ltd., Norwich Street, Cambridge.—**Stand A.319.**—"Hayn" self-propelled electric lawn mowers in 12 and 18in sizes.

Osborn Manufacturing Co., Ltd., 5/13, Highgate Square, Birmingham, 12.—**Stand C.507.**—Among the products shown are a new range of contemporary and modern electric light fittings; the "Cobra" paint scraper; the new "Cobra Heatwave" paint stripper; an anti-frost lamp; and an electric incinerator.

W. H. Paul, Ltd., Breaston, Derby.—**Stand B.329.**—In addition to the "Wash Wonder" electric washing machine the company is showing for the first time a steriliser sink, fitted with an immersion heater, which has been developed to meet the needs of the catering trade and industrial canteens.

John M. Perkins & Smith, Ltd., London Road Works, Braunston, Rugby.—**Stand D.702.**—Among a selection of "Mason Master" tungsten carbide tipped tools for the building and allied trades is the "Controlled Power" portable electric drill, specially geared for masonry work, with $\frac{3}{8}$in capacity chuck.

Phœnix Sales, Ltd., Winton House, St. Andrew Street, London, E.C.4.—**Stand A.609/A.504.**—On display is a full range of vacuum cleaners, including a new model which will shortly be available for home and export buyers.

Products K Blackpool, Back St. Helier's Road, Blackpool.—**Stand C.708.**—In the "Tele-Aquarium" series of television lamps the light is hidden behind the aquarium and is diffused. They are made up in various forms of wood, wrought iron, brass and ceramics, many being in contemporary designs.

Pyrotenax, Ltd., Hedgeley Road, Hebburn, Co. Durham.—**Stand C.715.**—This display illustrates the extensive use of "Pyrotenax" mineral insulated cable for all types of general wiring in factories, houses, shops, flats, etc. Other exhibits stress the particular suitability of "Pyrotenax" for the oil and marine industries, and the wide application of the company's heating cables covering radiant heating of buildings, pipeline tracing, de-icing, etc. Pre-assembled cable units are also shown.

Ransomes Sims & Jefferies, Ltd., Orwell Works, Ipswich.—**Stand B.723/B.634.**—The company's new "Forklift 3000" truck is capable of handling loads of up to 3,000 lb to a height of 14ft at 20in load centre. A very large battery (480 Ah) is fitted ensuring that a full day's work can be carried out before recharging becomes necessary. Other machines in the "Forklift" range are also on view in addition to electric tractors and platform trucks.

Skarsten Manufacturing Co., Ltd., 21, Hyde Way, Welwyn Garden City, Herts.—**Stand B.201.**—An electric paint scraper fitted with an "Inconel" element is included in this company's exhibits.

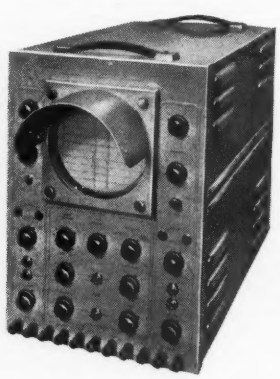
James Smellie, Ltd., Ivanhoe Works, Oxford Street, Dudley.—**Stand B.628.**—Two new designs of electric fires are shown. Being portable they are suitable for standing in front of the opening of a fireplace. Construction is of stainless steel and they are available in either 2 or 3 kW sizes. Electric fires in copper and bronze are also exhibited.

Frederick Smith & Co., 24, Queen Anne's Gate, Westminster, London, S.W.1.—**Stand C.717.**—Bare copper, cadmium-copper, bronze and copper alloy rods, wires, strips, strands, sections and forgings; power, trolley and telephone line wires; tinned and silver plated copper wires and strips; aluminium wire and strand; and aluminium alloy strand for power transmission lines.

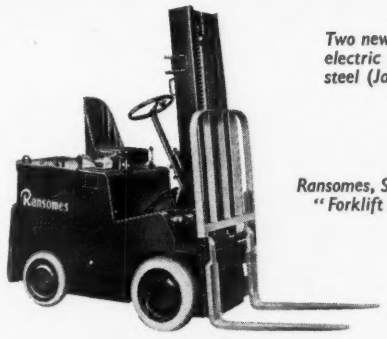
S. Smith (Electrical Fittings), Ltd., 85, Abercrombie Avenue, High Wycombe, Bucks.—**Stand C.221.**—A selection of hand-carved wood electrical fittings, in period and modern designs, includes floor and table standards, chandeliers, wall brackets, etc.

Southern Instruments, Ltd. (Oscillograph Division), Frimley Road, Camberley.—**Stand C.603.**—Among oscillograph recording equipment and other electronic apparatus shown are an ME122 two-channel engine indicator; an M972 double-beam oscilloscope; a TE12 transient recorder, an M731 universal recording camera; an M735 continuous-feed recording camera; a G218 torsional vibration pick-up; an M942 two-channel pen recorder; and a selection from the company's range of transducers. Demonstrations are given of engine-indicating using variable-capacitance transducers and the frequency-modulated amplifier system. Measurement of hydraulic pressures will be demon-

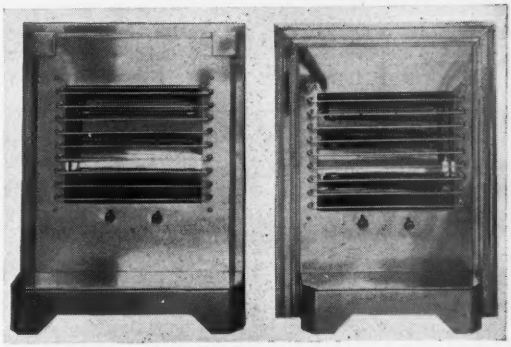
New Welbeck "Bak-Vak" industrial suction cleaner



Southern Instruments M972 double-beam oscilloscope



Ransomes, Sims & Jefferies "Forklift 3000" truck



Two new designs of 3 kW electric fires in stainless steel (James Smellie, Ltd.)

strated using resistance-type transducers and a d.c. amplifier system.

Spiral Tube & Components Co., Ltd., Osmaston Park Road, Derby.—**Stand D.710.**—Among a wide range of air heating equipment are all-electric unit air heaters; plenum air heaters and coolers; engine oil and water coolers; and coolers for use with compressors, transformers, alternators and generators; and heat exchangers.

W. & S. Summerscales, Ltd., Parkside Works, P.O. Box 12, Keighley, Yorkshire.—**Stand A.521.**—The electric washing machines exhibited include non-heated and heated models.

Herbert Terry & Sons, Ltd., Redditch.—**Stand B.424.**—"Anglepoise" lamps for home, office and workshop use are displayed. Two new colours, contemporary red and yellow, have been added to the range this year.

Vactite Wire Co., Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.—**Stand C.717.**—Resistance wires and tapes in "Vacrom" (nickel-chrome) and "Eureka" (cupro-nickel); molybdenum rods, wires and tapes; pure nickel and special wires for the electric lamp and radio valve industries.

H. C. Webb & Co., Ltd., Tame Road, Witton, Birmingham, 6.—**Stand A.431.**—The principal exhibits are lawnmowers, including 12 and 14in electrically propelled models. The range has been extended to include a new 14in self-propelled model. A de-luxe gear-driven 14in electric lawnmower takes a lawn-edge trimming attachment.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, Kings Cross, London, N.1.—**Stand C.508 & 1341/1240 (outdoor).**—Rectifiers for industrial, electro-chemical, telecommunication, battery charging, television, radio, cinema and electronic applications.

Wolseley Engineering, Ltd., Electric Avenue, Witton, Birmingham, 6.—**Stands D.713 (indoor), 1348 (outdoor).**—A new economy fencer pack provides a complete electric fence installation at ⅔ the normal price. Other exhibits include the "Power-Pak" sheep shearing machine; the "Wunda Mill" combined hammermill and mixer; pump units; and electric fencing posts.

Zinc Alloy Rust-Proofing Co., Ltd., Shakespeare Street, Wolverhampton. **Stand B.726.**—This company carries out a sherardising rust-proofing process for the makers of steel casements, bolts and nuts, electrical conduit, etc., and several sherardised products are on view.

Coal Dust Precipitators

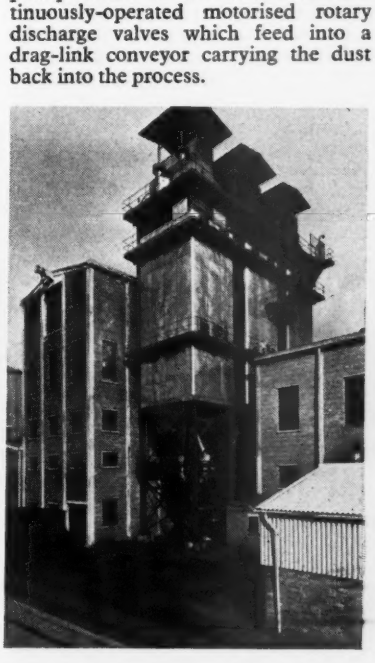
IN the official acceptance test on the Simon-Carves electro-precipitators at the National Coal Board's "Phurnacite" plant at Aberaman, South Wales, an efficiency of 99·93 per cent was obtained. This is believed to be the highest test efficiency ever recorded on a dry-type electro-precipitator in this country. It was achieved in spite of almost 25 per cent overload on design conditions. Over four tests, the average efficiency was 99·85 per cent.

The Aberaman precipitators are designed to remove fine coal dust from dryer gases. They are the first of their type in this country. In addition to preventing serious air pollution they recover a substantial and valuable quantity of coal dust. Under normal conditions, with two of the three precipitators in operation, this amounts to well over 300 tons a week.

The three precipitators are of the vertical gas flow type and each is designed to deal with about 33,000 cu ft/min of gas at 90 deg C. They incorporate chute-type receiving electrodes which reduce re-entrainment of the precipitated dust to the minimum. These electrodes have chutes or channels within which the precipitated dust is protected from the eroding effect of the gas stream.

Special precautions have been taken in the design of the precipitators to minimise the risk of self-ignition, which is a problem with certain types of dust, including fine coal dust, and to localise any damage in the event of a fire or pressure build-up. Hinged relief flaps at the gas outlets permit the immediate dispersal of any pressure wave which might develop. An automatic alarm is fitted to give warning in the event of combustion of the dust and the precipitators are equipped with injectors which can automatically fill the plant with steam to extinguish a fire. As a precaution, the support insulators for the h.v. discharge electrodes are mounted outside the gas stream thus preventing the danger of flashover and tracking by making it impossible for any dust to collect on the surface of the insulators.

The hoppers which receive the precipitated dust are fitted with continuously-operated motorised rotary discharge valves which feed into a drag-link conveyor carrying the dust back into the process.



Simon-Carves electro-precipitators at the "Phurnacite" plant at Aberaman

INDUSTRIAL NEWS

British Atomic Energy Display at Hanover

At the Hanover Trade Fair, which opened on Sunday last, the United Kingdom Atomic Energy Authority has provided material for two stands: one of them devoted to developments in nuclear power and the other to radioactive isotopes.

Nuclear power exhibits cover an area of 4,000 sq ft and include new models of the Dounreay and Calder Hall projects. The Calder Hall model will show for the first time the complete station with four reactors and four cooling towers. Other models and photographs will show the processes by which the atomic reaction provides heat for conversion by steam processes to electricity and some of the ideas for future types of power stations on which research work is in progress.

The Atomic Energy Research Establishment at Harwell has arranged an exhibit dealing entirely with the uses which have been developed for industrial purposes of radioactive isotopes produced at Harwell and Amersham. Production of isotopes from these two centres is now running at over 30,000 consignments a year, of which more than one-third are exported to countries all over the world.

The British atomic power industry is represented on the U.K. Nuclear Energy Stand at the Fair through the Nuclear Energy Trade Associations' Conference (N.E.T.A.C.), the membership of which consists of the seven principal engineering trade associations concerned with nuclear power.

Mr. Martin Whitehouse, M.A., B.Sc.(Econ.), A.M.I.E.E., head of the Technical Division of the British Engineers' Association, and Mr. Robert Kaan, Export Division, British Electrical and Allied Manufacturers' Association, are representing N.E.T.A.C. at the Fair. As part of its programme to make better known overseas the achievements of British industry in the nuclear energy field N.E.T.A.C. has produced an illustrated brochure, "Britain Leads in this Atomic Age," a German translation of which is available at the U.K. Nuclear Energy Stand.

Instrumentation for Australian Reactor

The complete nucleonic instrumentation and control circuitry for the first experimental atomic reactor to be exported from the United Kingdom will be supplied by Ekco Electronics, Ltd. This instrumentation, for the reactor now under construction at Lucas Heights, near Sydney, has been pre-tested at the Southend Ekco Works and is shortly to be shipped to Australia.

Under contract to Head Wrightson Processes, Ltd., of London, Ekco engineers will also be responsible for the erection, testing, installation, and commissioning of the entire nucleonic instrumentation on site in Sydney.

The reactor itself is heavy water moderated with enriched uranium fuel rods and at a thermal output of 10 MW will provide a flux of 10^{14}n/cm^2/sec, which is among the highest in the world. It has extensive experimental facilities and will enable much essential research to be performed in a shorter time than previously.

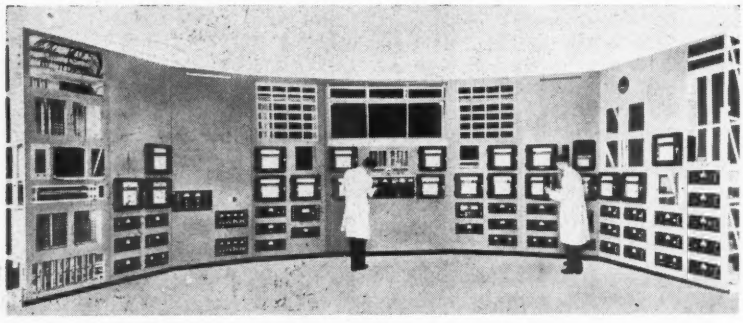
The monitoring, control and safety instrumentation is contained in a series of instrument panels grouped around the control position. One group of instruments measures and records the physical states of the reactor circuits such as, for example, pressure flow and temperature of the heavy water moderator. A second group measures the neutron flux at various points in the reactor as well as the rate of change of flux and its departure from a predetermined level.

Information from both the physical and nuclear instrumentation is combined with indication of reactor conditions provided by further equipment associated with the numerous control mechanisms. This combined information is fed to a third system which ensures the safe operation of the reactor at all times. In-built control circuits ensure that a definite procedure sequence is followed when starting up the reactor. Failure to carry out this sequence prevents the reactor from becoming operational.

Any tendency for the reactor to develop a fault which may become dangerous is detected automatically and a shut-down occurs. The speed and degree of shut-down is graded according to the seriousness of the initiating fault.

Health instrumentation is provided at numerous points in and around the reactor to monitor both the gamma and the fast neutron dose-rates. In the case of gamma radiation the reading is displayed both locally and remotely on logarithmically scaled meters and is also recorded.

Ekco engineers testing the control room instrumentation in conjunction with the control and safety circuits for the reactor under construction at Lucas Heights, nr. Sydney



Asea Electric Statement

It is announced that the Asea Company, of Vasteras, Sweden, and the Brush Group, Ltd., have made an arrangement whereby the latter will acquire the equity of Asea Electric, Ltd., also trading as Fuller Electrical & Manufacturing Co., Ltd. It is intended that the present activities of these two companies, including exclusive representation for Asea, Sweden, in the United Kingdom, will continue exactly as before but under the name of Fuller. By a licence agreement between the Fuller Company and Asea, Sweden, the former will be assured for a minimum period of ten years of full participation in the technical knowledge, research and development of the Asea group of companies within the field in which the Fuller Company will be active as electrical plant manufacturers. Mr. Ian Morrow and Sir George Briggs, directors of the Brush Group, will become chairman and vice-chairman of the company. Mr. Nils Plahn will remain managing director and there will be no change in the present management.

Graphite Anodes for Cathodic Protection

Most of the corrosion of buried or submerged metal structures can be prevented by the use of the impressed method of cathodic protection. Carbinert graphite anodes are being supplied extensively to cathodic protection engineering organisations by the Morgan Crucible Co., Ltd., of Battersea. They are rendered completely impervious by wax or resin

impregnation to give the maximum possible working life in all types of soils and waters. Applications for which these anodes have been used include the protection of buried pipelines, jetties, wharves, storage tanks and ships' hulls.

The anodes are stocked in sizes ranging from 2½in in diameter to 6in diameter, in lengths up to 80in. This ensures minimum delay in meeting demands. Only for very large installations and demands outside the stocked range is it necessary to manufacture anodes specially.

Apprenticeship in Electrical Contracting

In 1948 the Minister of Works appointed an Apprenticeship and Training Council for the Electrical Contracting Industry under the chairmanship of Sir George Gater with representatives of the National Federated Electrical Association and the Electrical Trades Union. A national apprenticeship scheme was prepared by the Council and put into operation in 1950.

The scheme provides for apprenticeship to begin usually at the age of 16 and end at 21. Boys under 18 are required to attend at technical colleges up to a maximum of 44 days a year or the equivalent in day and evening classes; employers pay the fees for the classes and also wages for attendance by day.

The second report of the Council just issued shows that between 1950 and 1956 over 15,000 apprentices were registered and certificates of completion were issued to more than 2,000. Since 1953 the Council has awarded five scholarships, each valued at about £750, for courses leading to a degree or a Higher National Diploma. The Council has awarded prizes to registered apprentices for exceptionally good work during apprenticeship since 1953. In 1953 30 prizes were awarded, in 1954 56 and in 1955 60; all were of £2 each for the purchase of technical books and book-plates were supplied for fixing to the books.

Electricity Clerical Grades' Salaries

At a special meeting on 16th April the National Joint Council (Administrative and Clerical Grades), Electricity Supply Industry, agreed to revisions of the salary scales which it administers. These cover general and higher general clerical staff, shorthand-typists, machine operators, telephone operators, draughtswomen and women tracers, and assistant nurses.

Electrolux Refrigerator Fortnight

Electrolux, Ltd., has commenced this week its "Refrigerator Fortnight," during which it is running an advertising campaign based on the reliability of its refrigerators and emphasising their value in lighthouses and lightships, in which over 170 are installed. Publicity includes large scale advertising in the national Press, periodicals and women's magazines and publicity material for dealers.

Canadian Power Show

Canada's Power Show, which is sponsored by the Canadian Institute of Power Engineers, will be held from 21st to 24th October next in the New Queen Elizabeth Building, Exhibition Park, Toronto, Ontario. Exhibits will embrace all types of equipment related to the generation of power, and will include gas turbines, steam power generators, valves, steam traps, strainers, temperature regulators, compressors and various kinds of engines. United Kingdom firms who would like their agents to display their goods at this exhibition should ask them to write to the general secretary, Institute of Power Engineers, Power Show Office, 199, Bay Street, Toronto, 1, Ontario. The Exhibitions and Fairs Branch of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1 (telephone: Chancery 4411, extension 435), will answer inquiries and has available for perusal copies of the application forms and floor plan. Reference Number E. & F. 250/57 should be quoted.

Electrical Installation in "Mayflower II"

The *Mayflower II*, which recently sailed for America, is equipped with thirty-six Simplex "Prismax" type bulkhead fittings. Simplex weatherproof switches and switchplugs, together with 12372 type glands, are also installed. At the A.S.E.E. exhibition the company showed a special display panel of photographs depicting its products aboard *Mayflower II*, and this has been re-issued in the form of a showcard.

Public Transport Association Conference

The annual conference of the Public Transport Association has been held this week at Eastbourne. Two papers have been presented, one on "Advertising and Selling Road Passenger Transport," by Mr. J. H. Richardson, and the other on "Stores Control and Accounting," by Mr. D. E. Eyres. Social events have included a golf tournament, a civic reception and dance, and coach tours for the ladies.

Clean Air Year Book

The National Smoke Abatement Society has issued the 1957 edition of its "Clean Air Year Book." In this the Clean Air Act is explained in simple outline, with references to those parts already in operation and the regulations issued by the Ministry of Housing. There is also information about other legislation relating to air pollution—the Alkali Works and Road Traffic Acts, smokeless zones, etc. Other articles and notes describe such matters as the investigation of air pollution, the training of boiler operators, major smog disasters, estimates of pollution, a synopsis of the subject for the guidance of lecturers and writers, together with classified lists of publications, and of recent papers and reports.

The Year Book (1s 6d, or 1s 8d, by post) may be obtained from the Society at Palace Chambers, Bridge Street, London, S.W.1.

New Goods Elevator

A new type of goods elevator has been produced by Barron & Shepherd, Ltd., 16, Blackfriars Lane, London, E.C.4, and the accompanying picture shows one installed in the stores area of the British European Airways Corporation at London Airport.

A moving platform or cage is cantilevered out from a main frame in such

A self-contained goods elevator installed at London Airport

a manner that it requires no attachment to the surrounding structure, since the unit is entirely self-contained. In this instance, the elevator is used to transfer stores trolleys between the two levels of double-stage storage racking. Operation is by push-button control and power is provided by an electric motor fitted with an electromagnetic brake driving through chains and pinions with limit switches and electrical and mechanical interlocking gates at both levels.

City and Guilds Annual Report

A year of steady progress and achievement is recorded in the annual report of the City and Guilds of London Institute for the year to 30th September last. This states that the outstanding event of the year affecting the Institute has been the publication of the Government's plans for technical education, from which it is clear that the Institute has an even greater role to play in the future. With this programme in mind, coupled with such broad issues as the development of technical education and training overseas, the needs of the Institute have been largely clarified, and the Council has launched an appeal for a definite stable income of £50,000 per annum

from industry and commerce. Other information included in the report deals with new and revised schemes of syllabuses and examinations, the work of the Associated Examining Board, and a list of members, Council, Committees and staff.

Theatre Emergency Lighting

The Davis Theatre, Croydon, has been equipped with a "Keepalite" emergency lighting system supplied by Chloride Batteries, Ltd. The battery consists of fifty-five Chloride DBNG8 cells of the sealed-in type. It has a capacity of 240 Ah at the 10-hour rate and will maintain the emergency load of 6 kW for just over three hours.

Plessey Machine Tool Control Agreement

A licensing agreement which provides for the future manufacture of automatic machine tool control components has been concluded between the Plessey Co., Ltd., and Farrand Controls Inc., of New York. Under the agreement, Plessey will develop in this country during the next two years applications for the existing Farrand system of electronic machine tool control.

Communication Equipment for Indian Airports

Pye Telecommunications, Ltd., has secured a contract from the Indian Department of Civil Aviation for communication equipment for a modernisation programme for thirty-nine Indian airports. The equipment is to provide aerodrome approach control and runway control communication.

New T.I. Company

Tube Investments, Ltd., has formed a new subsidiary company, Old Park Engineering, Ltd., of Dudley, Worcestershire, to take over general welded fabrications and structural work previously carried out by Round Oak Steel Works, Ltd.

Batti-Wallahs' Society

The guest speaker at last week's luncheon of the Batti-Wallahs' Society was Mr. A. McL. Mooney, who was also making his first appearance as a member of the Society, and his address was on "The Size of the Universe." Before luncheon commenced, Mr. W. C. M. Couch, the retiring president, inducted the new president, Dr. L. G. Brazier, into the chair and in so doing said how much he had enjoyed his term of office. He expressed his thanks for the support accorded him, and wished Dr. Brazier a successful year of office. Dr. Brazier, in a brief reply, thanked the Society for the honour accorded him and presented to Mr. Couch the past-president's badge.

The mysteries of the universe have excited the imagination of man from the beginning of time, and even to-day, with the aid of the telescope, the spectroscope and radio astronomy, its vastness is only dimly comprehended; much will no doubt remain unfathomable until the end of time. Mr. Mooney, with the aid of lantern slides, succeeded in conveying to his listeners the immensity of the universe, and the infinitesimal part played by our own little world.

The next luncheon of the Society will be on Thursday, 30th May, when the guest speaker will be Sir Kenneth Grubb who will speak on "Life in Interior Brazil."

Identification of Photographs

In our daily post we receive many photographs and it is always possible for them to become separated from the letters accompanying them. It is important therefore that readers who send photographs (especially personal portraits) should make sure that they bear sufficient information to enable them to be identified.

American General Electric Report

The annual report of the International General Electric Co., of New York, states that its group of companies produced and sold a record of $4,090 million of goods and services in 1956, an increase of 18 per cent over the sales for the preceding year. The report, which is profusely illustrated in colour, indicates some of the many new developments in the industrial and domestic fields.

Metal Industry Handbook

The 1957 edition of "Metal Industry Handbook and Directory" is now available. The handbook is recognised by all engaged in the non-ferrous metal industries as a standard work of reference, and the new edition contains up-to-date information on the properties of the newer as well as the more familiar metals. There is a section devoted to summaries of British Standard aircraft materials, D.T.D. and Admiralty specifications, and also one on the chief metal finishing processes and data regarding all the common rod, bar, sheet and strip products. The tables giving the weight of aluminium in sheet, rod, and tube form have been completely revised and there is a comprehensive buyers' guide. The handbook is published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price 15s net. Subscribers of *Metal Industry* receive a complimentary copy.

Calendar

A charming lady adorns the calendar for 1957-58 received from the Metropolitan-Vickers Electrical Co., Ltd.

Electricity and Food Hygiene

The important part that electricity and electrical appliances can play in enabling people to comply with the Food Hygiene Regulations made under the Food and Drugs Act, 1955, is the main feature of the British Electrical Development Association's exhibit (Stand No. 23) at the Health Exhibition, Langhorne Gardens, Folkestone, which closes to-day (Friday).

Electrical appliances to be seen on the E.D.A. stand include a 30-gal u.d.b. water heater (Aidas Electric, Ltd.); a 3-gal over the sink heater (Santon, Ltd.); an automatic dish washer (Dishlex Division of Scotts Engineering, Ltd.); a floor scrubber and polisher (Cimex-Fraser Tuson, Ltd.); moisture-proof fluorescent lighting fittings (A.E.I. Lamp & Lighting Co.); an air conditioner for providing clean air (Temperature, Ltd.); a hot closet (Gardner & Gulland, Ltd.) and a commercial refrigerator (Frigidaire).

Trade Announcements

The postal address of the Transformer Department of the **Metropolitan-Vickers Electrical Co., Ltd.,** is now Floats Road, Wythenshawe, Manchester, 23. For cables and telexes the Department will continue to use the Trafford Park address, Metrovick Manchester Telex 66-314.

The **A.E.I. Lamp & Lighting Co., Ltd.,** has closed its area stores at 54, Selsdon Road, Croydon, and all inquiries and orders should now be addressed to the company at 44, Fitzroy Road, London, N.W.1 (telephone: Primrose 7750). Mr. W. Steer (area superintendent) and Mr. F. A. Cox will be at the new address.

Brown Brothers, Ltd., are opening a new branch at Hill Street, Sheffield, 2 (telephone: Sheffield 26732). It is expected that the branch will be in full operation as from Monday, 6th May. It will be under the management of Mr. S. J. Hillier.

The Birmingham cable sales office and warehouse of **Standard Telephones & Cables, Ltd.,** is now at 48, Kenyon Street, Birmingham.

Mr. D. W. Hooper, who has been representing **Ekco-Ensign Electric, Ltd.,** in the West End area of London, has been transferred to the City of London area.

The telephone number of the Anerley Works of **Londex, Ltd.,** is now Sydenham 3111, and that of the main works for buying inquiries and progressing orders Sydenham 6258.

Acrow (Engineers), Ltd., has concluded an agreement with the German Demag Group, whereby Acrow will look after the Demag-Zug interests in the United Kingdom.

The telephone number of the **Revo Electric Co., Ltd.,** is now Tipton 2828.

The telephone numbers of the Huyton Quarry Works of **British Insulated Callender's Cables, Ltd.,** are now Huyton 4591-3.

Control Components, Ltd., has moved its offices and works to Croft Works, 93, Moore Park Road, London, S.W.6 (telephone: Renown 7181).

Submarine Cables at 138 kV

BRITISH COLUMBIA TO VANCOUVER ISLAND POWER TRANSMISSION

LAST September a 138 kV connection of 43 miles was put into service between the lower mainland of British Columbia and the southern part of Vancouver Island. For two sections of 14·7 and 2·9 miles (see route diagram), submarine cables of the gas-filled pre-impregnated type were installed. In all 93·5 miles of cable were made.

Load requirements of the British Columbia Electric Co., design features and performance of the single-core 138 kV cables and accessories and particulars of the special plant developed for manufacture and handling of cable in continuous lengths (requisite to avoid hazards of jointing at sea) were described in a paper presented before the Supply Section of the Institution of Electrical Engineers on 25th April. The authors were Dr. T. Ingledew (British Columbia Electric Co.), Messrs. R. M. Fairfield (British Insulated Callender's Cables), E. L. Davey and K. S. Brazier (B.I.C. Submarine Cables) and J. N. Gibson (B.I.C. Construction Co.).

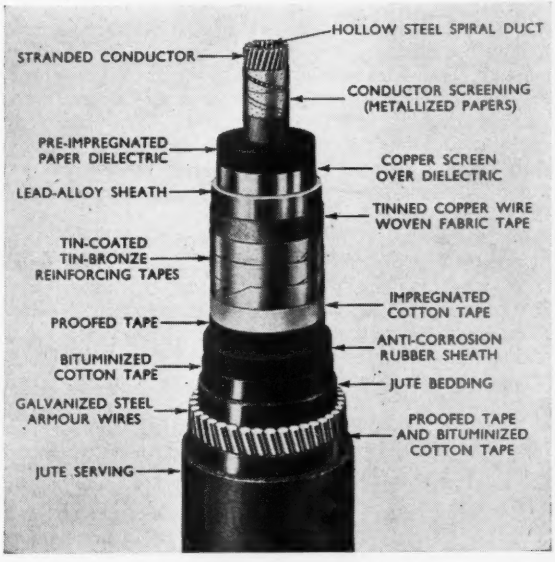
Details of Construction

The 138 kV overhead line sections have four conductors, each connected to a single-core submarine cable, one being spare. A fifth cable is installed, at present as a standby, but with two further cables to be laid later there will be two 120 MW three-phase circuits with one common spare. Both terminal stations are unattended and remotely controlled.

Major design requirements were: suitability for operation at a depth of 100 fathoms; satisfactory gas transmission; mechanical properties to withstand arduous conditions of handling and laying; adequate protection against corrosion and resistance to fatigue. Two extensive sea trials at 100 fathoms in Loch Fyne (including laying, grappling and recovering the cable) were carried out, using the P.O. cable ship *Alert*. The construction of the cable is shown in the accompanying illustration and some particulars are given in the table on page 832. Maximum external sea-water pressure is 265 lb/sq in and, to prevent any extensive ingress of water into a damaged cable, the internal gas pressure is 300 lb/sq in, the maximum rate of flow being maintained automatically. Electrical stress at the conductor is 85 kV/cm. Dielectric loss angle at working voltage 60 c/s and 50 deg C (the highest operating temperature under water) is 0·0033. The current rating is 500 A and the charging current is 5·8 A/1,000 yd. Losses per 1,000 yd of three-phase circuit amount to 119 kW made up of: conductors, 60·5 kW; dielectric, 3·5 kW; sheath reinforcement and armour, 55 kW.

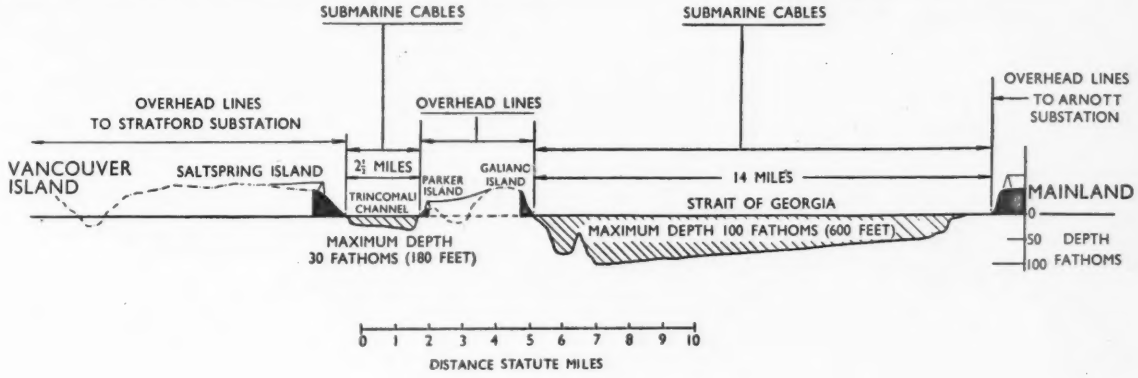
The hollow conductor construction has necessitated modifications to the normal sealing ends as used for land cables and a double porcelain arrangement is employed. Two kinds of joints have been developed. One is a reconstituted joint of the same dimensions and flexibility as the cable, which is intended for use in the factory in the event of accident during manufacture. The other is a rigid submarine repair joint. Manufacture started on 1st April, 1955, and was completed on 2nd March, 1956.

The plant required for the production of continuous



Construction of the 138 kV gas pressure submarine power cable

Diagram showing route of cable between Vancouver Island and the mainland



DIMENSIONS OF CABLE COMPONENTS

Component	Radial thickness inches	Cumulative diameter inches
Spiral steel duct (internal dia. 0·47in)	0·030	0·530
Copper conductor 42/·105in 0·35in²	0·210	0·950
Metallised paper conductor screen	0·0105	0·971
Pre-impregnated paper dielectric	0·575	2·121
Copper-tape dielectric screen ..	0·003	2·129
Alloy E (B.S. 801 : 1953) sheath ..	0·150	2·429
Reinforcement bedding	0·012	2·453
Tinned 1% tin-bronze reinforcing tapes (3 × 0·009in)	0·027	2·507
Compounded cotton tapes ..	0·027	2·561
Vulcanised-rubber anti-corrosion sheath	0·120	2·801
Armour bedding	0·118	3·037
Single-wire armour, galvanised steel, 25–32 tons/in² tensile ..	0·232	3·501
Bituminised cotton tape	0·050	3·601
Jute serving..	0·180	3·961

lengths of cable has the following sequence of operations: stranding of conductor on to turntable; insulating and lead sheathing in tandem, with an accumulator system of pulleys for storing 130 yd of cable between the insulating machine and lead press; storing sheathed cable on a second turntable, whence it is taken to be reinforced, v.r. sheathed, armoured and served. The completed cable (3,900 tons) was conveyed by gantry to a coiling shed, from which an overhead gantry transported it to tanks in the *Ocean Layer* (4,600 tons displacement). Cable laying started on 16th July last.

The cables were charged with nitrogen at 10 lb/sq in before loading on to the ship. Immediately after laying and before making the terminations, the cables were tested at 276 kV d.c. for 15 min at atmospheric pressure. After terminating they were gassed up to 350 lb/sq in and re-tested as before. Since the cables went into official service on 25th September they have been in continuous operation except for brief periods for testing and for overhead line maintenance. No operating problems have been encountered except for a minor gas leak, which was remedied.

DISCUSSION

Opening the discussion Sir Josiah Eccles (Central Electricity Authority) described the installation as creating a record for high voltage and distance in submarine power transmission. He commended the paper to younger engineers as an example of the thought and detailed consideration that had to be applied at every stage of a large project. For the cross-Channel cable between England and France 200 kV d.c. with a conductor return had been decided upon, since many difficulties arose in tying two different systems together by an a.c. connection of moderate capacity.

Sir John Dean (Telegraph Construction & Maintenance Co., Ltd.) substantiated from experience the wonderful planning and engineering and excellent design. After several trial runs which enabled the captain of the *Ocean Layer* to feel his tides and the seamen and cable hands to plan their work in an orderly manner, everything went splendidly. The Pleuger rudder enabled the ship to be kept under control at speeds at which it would probably be impossible to steer with a normal ship laying heavy cable in difficult tides. This rudder had a 400 h.p. submerged motor and a propeller rather like an outboard motor on a small boat.

Monsieur Tellier (Electricité de France) referred to the project as one of the great achievements in the history of high-voltage submarine transmission. For a submarine link by a single cable, like the d.c. cross-Channel interconnection, the advisability of utilising a similar method could be questioned, however, on account of its high cost and the necessity for very favourable sea conditions. It might be preferable in the cross-Channel case to make a joint at sea, thus simplifying the laying operation of the terminal length, whilst dividing the operation into successive independent stages.

Proposed Channel Cable

Mr. D. P. Sayers (Central Electricity Authority) pointed out that in the Strait of Georgia the longest submarine link was 14·5 miles with a depth of 100 fathoms, as compared with 25 miles and 30 fathoms in the English Channel. In the English Channel faults due to ships trawling represented a serious hazard in operational availability.

Mr. R. J. Halsey (Post Office) compared the complicated structure required for a power cable with the solid polythene dielectric of the transatlantic cable. The Post Office Engineering Department preferred galvanised-steel armour wires to aluminium-alloy wires, which might exhibit a greater tendency to "birdcage" in handling; their behaviour in tidal waters was an unknown quantity. They were interested in the minimum permissible bending diameter of 6ft and would like 6 or 7ft maintained as the maximum they were asked to handle.

Mr. C. H. Jolin (Merz & McLellan) criticised the method of laying the cable and suggested consideration of a caterpillar control. If a new cable-laying ship could be designed with the ship's own machinery in the stern, the rest of the space could be used for cable tanks and space might then be found for a suitable caterpillar.

Mr. H. H. Schofield (Central Electricity Authority), who had witnessed the installation of the cables, thought it might be better to space the landing of the cables a little in order to make the operation of the scow easier. Now that the making of the first joint had been brought down to a reasonable time it might be preferable to install joints close inshore instead of trying to land the cable in a continuous length.

Mr. C. C. Barnes said that the primary object of the sea trials of the cross-Channel project in 1954 and 1955 was to determine the effect on the cable and associated joints of the severe mechanical conditions associated with the laying from a cable ship and to obtain experience of making and laying joints at sea.

Mr. W. Casson (Central Electricity Authority) observed that the location and repair of a cable fault might be difficult and hazardous. If the original English Channel scheme had been proceeded with, the link might have been in an advanced stage of construction by now, but a change had been made from three 132 kV a.c. cables with spare cable to d.c. at 200 kV between conductors using one cable only. Tenders were due by the end of May and he wondered whether a polythene cable would be offered.

Junior Institution of Engineers' Bursary

The Junior Institution of Engineers invites entries for the annual Durham Bursary competition. Entrants, who must be over 19 and under 25 years of age, compete by submitting a thesis on some engineering, technical or scientific subject selected by the entrant. Further particulars may be obtained from the Institution at Pepys House, 14, Rochester Row, London, S.W.1.

INSTRUMENTS-ELECTRONICS-AUTOMATION

Exhibition and Conference

—AT OLYMPIA

ENTERPRISE together with the application of advanced technical knowledge by approximately two hundred of Great Britain's leading manufacturers in the fields of electronics, automatic control and industrial instrumentation during the last few years are now acknowledged to be affecting our daily lives more and more. Progress in these branches of electrical science and engineering will be illustrated in an exhibition which is being held at Olympia, London, from 7th to 17th May.

Development in these fields of electrical engineering following the demand for improved methods of automatic control has meant an increase in the number of manufacturers. Amongst the concerns now engaged in the manufacture of such products are many of our old established instrument makers. This fact was most noticeable especially when a recent review was made of the latest additions to the list of electrical instrument manufacturers.

A significant feature is the interest which has been shown by "Iron Curtain" countries. Almost all of them have sent detailed requests for information or facilities, through their research centres or technical organisations and their Embassies in London, and notice has been received of intending visitors from a number of these countries. In addition to Eastern Europe, facilities at the exhibition and the accompanying conference have been requested from every country in Western Europe; from the majority of Commonwealth countries including Australia, Canada, India and South Africa; and from the United States. Organised parties will be coming from Scandinavia, France and Germany.

Thirty-seven of Britain's leading experts on the techniques of instrumentation, electronics and automation will take part in the seven-day conference at which every aspect of these new industries will be reviewed and discussed. It is expected that many recent developments will be announced in public for the first time. The conference, which forms an essential part of the exhibition, will be held within the exhibition building, and tickets will be available only at Olympia itself. Each day of the conference is being devoted to a specific subject. At the morning session there will be a general review of the subject, whilst more specific techniques and applications will be dealt with in the afternoon.

The lectures and discussions will range from the control of nuclear reactors to the use of the artificial heart in surgery, and from the part which electronics will play in the office of tomorrow, to the use of automation in the cooking and canning of foodstuffs. Two papers will deal with recent developments in radar at sea and in the air. Others will cover future developments in communications, the automatic control of machine tools, and the ever-present problem of the training of technologists.

The conference (like the exhibition itself) is being promoted by the five trade associations most concerned with these new developments and a prominent figure from one of them will take the chair at each session.

The arrangements for the conference are as follows:—

PROGRAMME OF CONFERENCE

Wednesday, 8th May—
AUTOMATION DAY

11 a.m. Chairman: G. A. Whipple (S.I.M.A.). "The New Age," by Lord Halsbury, F.R.I.C., F.Inst.P., managing director, National Research Development Corporation.

3 p.m. Chairman: M. H. Taylor (S.I.M.A.). "Computer Controlled Machine Tools," by J. N. Toothill, C.B.E., general manager, Ferranti, Ltd. "Electronically Controlled Machine Tools," by C. A. Sparkes, technical director, H. W. Kearns & Co., Ltd.

4 p.m. "Automatic Gauging," by L. Loxham, M.I.Mech.E., M.I.Prod.E., F.R.S.A., managing director, Sigma Instrument Co., Ltd.

Thursday, 9th May—
NUCLEAR DAY

11 a.m. Chairman: D. D. Walker (B.E.A.M.A.). "Nuclear Power," by Sir Claude Gibb, K.B.E., D.Sc., F.R.S., chairman and managing director, C. A. Parsons & Co., Ltd.

3 p.m. "Controlling a Research Reactor," by R. J. Cox, B.Sc., M.I.R.E., A.M.Brit.I.R.E., Electronics Division, U.K. Atomic Energy Authority. "The Place of Analogue Computers in Reactor Control," by J. Walker, M.A., A.M.I.E.E., Reactor Division, U.K. Atomic Energy Authority, Harwell.

3.45 p.m. "Radio Isotopes in the Nucleonic Industry," by H. Seligman, Ph.D., head of the Isotope Division, U.K. Atomic Energy Authority.

Friday, 10th May—
EDUCATION DAY

11 a.m. Chairman: E. E. Semmens (B.E.A.M.A.). "Instruments — A Career with a Future," by P. Dunsheath, C.B.E., D.Sc., M.A., M.I.E.E., M.I.C.E., chairman, Cambridge Instrument Co., Ltd.

3 p.m. Chairman: H. W. Blake (B.I.M.C.A.M.). "The Technologist —His Training and Reward," by G. L. D'Ombrain, Ph.D.(Eng.), D.I.C., A.C.G.I., M.Am.I.E.E., M.I.E.E., head of Electrical Engineering Department, Battersea Polytechnic.

3.45 p.m. "Training for Research," by J. Thompson, M.A., D.Sc., F.Inst.P., M.I.E.E., director of research and secretary, Scientific Instrument Research Association.

Monday, 13th May—
MEDICAL DAY

11 a.m. Chairman: J. E. C. Bailey (S.I.M.A.). "Instrumentation in Medicine," by Professor J. Rotblat, F.Inst.P., D.Sc.(Lond.), D.Sc.(Warsaw), Ph.D., Professor of Physics in London University at St. Bartholomew's Hospital.

3 p.m. Chairman: P. Goudime (S.I.M.A.). "The Artificial Heart-

Automation Exhibition and Conference

(Continued from preceding page)

Lung," by D. G. Melrose, B.M., B.Ch., Hammersmith Hospital.

3.45 p.m. "Electronic Instruments for Clinical Tests with Radioactive Isotopes," by N. Veall, B.Sc., F.Inst.P., Physics Department, Guy's Hospital, and E. W. Pulsford, B.Sc., A.M.Brit.I.R.E., Electronics Division, U.K. Atomic Energy Authority.

Tuesday, 14th May—
INDUSTRIAL DAY

11 a.m. Chairman: L. S. Yoxall (B.I.M.C.A.M.). "Instrumentation in Industry," by Sir Ewart Smith, M.A., M.I.Mech.E., M.I.Chem.E., technical director and deputy chairman, Imperial Chemical Industries, Ltd.

3 p.m. Chairman: A. J. Young (S.I.T.). "Instrumentation in the Textile Industries," by J. E. Fielden, M.Sc., A.M.I.E.E., director, Fielden Research, Ltd. "Instrumentation in the Paper Industries," by B. W. Balls, B.Sc., M.I.Chem.E., technical sales manager, Foxboro-Yoxall, Ltd.

4 p.m. "Fuel Efficiency in all Industries," by R. Clare, B.Sc., M.Inst.F., deputy area manager, National Industrial Fuel Efficiency Service. "Instrumentation in the Food Industry," by A. J. Goodall, B.Sc., F.R.I.C., M.R.S.H., general works manager, Batchelors Peas, Ltd., Sheffield.

Wednesday, 15th May—
COMPUTER DAY

11 a.m. Chairman: R. G. Kent (B.I.M.C.A.M.). "The Electronic Office," by Sir Walter Puckey, F.I.I.A., M.I.Prod.E., chairman, Automation Consultants & Associates, Ltd.

3 p.m. Chairman: N. Sheldon (B.L.S.G.M.A.). "Production Control Procedures using a Computer," by J. W. Grant, A.M.I.I.A., manager, Sales Division, Production Control Department, British Tabulating Machine Co., Ltd.

3.45 p.m. "Electronics in Banking," by L. Temple, manager, Research and Development Department, Lloyds Bank, Ltd.

Thursday, 16th May—
COMMUNICATIONS AND NAVIGATION DAY

11 a.m. Chairman: E. E. Semmens (B.E.A.M.A.). "Communications and the Future," by Sir Gordon Radley, C.B.E., Ph.D.(Eng.), Director-General, General Post Office.

3 p.m. Chairman: P. Goudime (S.I.M.A.). "Recent Developments in Marine Radar," by A. L. P. Milwright, Royal Naval Scientific Service.

3.45 p.m. "Air Navigation," by T. G. Thorne, Radar Research Establishment, Ministry of Supply.

New Thorn Offices

ONE of the highest office buildings in England is to be built by Thorn Electrical Industries, Ltd., at the corner of Upper St. Martin's Lane and West Street, London, W.C.2. The cost is estimated to exceed £750,000. Standing on a 2,700 sq yd site, the building will consist of a high office block of fifteen levels rising to 184ft above the street and a long low showroom extending horizontally from the lower level, forming a large "L" shape. The tower block will stand on eighteen reinforced concrete pillars 20ft high, thus giving free access to the area beneath the block, where a paved garden with trees and shrubs will be open to the public.

At night the building will be Britain's biggest electricity showpiece. More than 200 fluorescent tubes will floodlight the 20,000 sq ft south side of the building facing down St. Martin's Lane. These tubes will give a blue light to contrast with the warmer colour of the interior illumination seen through the windows.

Office working conditions in the new building will be among the best in London. Employees will find themselves in an office in which most of one wall is glass. These "picture windows" will command views to the north as far as Hampstead and Highgate and to the south, Westminster, the Thames and as far as the North Downs. The offices will be heated by thermostatically controlled convector heaters concealed in panels below window sills. In summer, discomfort will be avoided by a special glass which admits the sun's rays while filtering out excessive heat. Specially designed ceilings of acoustic material will reduce noise.

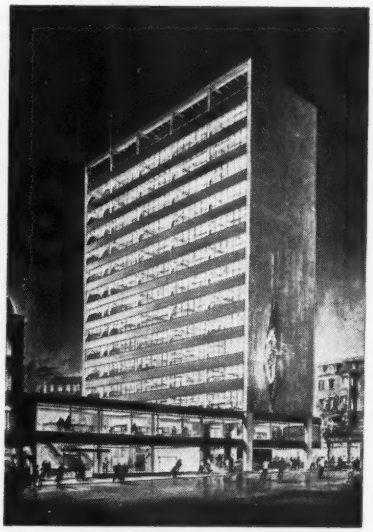
The interior lighting will be one of the most adaptable systems ever used in a large commercial building. Channels at 4ft 2in intervals will enable lighting fittings to be re-sited to conform to any changes in interior layout. Other unusual features are the use of doors operated by light rays and large shutters which will descend at night to secure privacy of the open ground floor area.

Four lifts, travelling at 700 ft/min, will carry 600 to 700 people to 13 different levels during the 30 minute rush period. Operating as a team, the lifts will be electronically controlled and will give audible warning to passengers attempting to hold the doors open.

There will be space for 40 cars in the basement and additional parking space on the ground floor area away from the street. The building is expected to be completed by the end of 1958.

The architects for the building are Basil Spence & Partners (Professor Spence is the architect of the new Coventry Cathedral) and the electrical and mechanical consulting engineers are A. F. Myers & Partners.

Mr. Jules Thorn, chairman and managing director of Thorn Electrical Industries, has said that the company's main object in erecting this building is to bring together numerous departments at present scattered. In their planning they have had to bear in mind the future expansion of the company in the fields of television and lighting.



An impression of the new building to be erected by Thorn Electrical Industries, Ltd., on the corner of Upper St. Martin's Lane and West Street, London, W.C.2. The tower block, 184ft high, will stand on concrete columns 20ft high to allow free access to the space at ground level. The showroom will have an area of 6,000 sq ft

Southern Region Electrification Plans

AT a Press preview of one of the new multiple-unit diesel-electric trains which are to go into service on the London to Hastings route, a British Railways Southern Region spokesman said that the third-rail electrification on the Sittingbourne, Sheerness, Faversham, Canterbury, Dover, Deal, Ramsgate and Margate routes would be completed by 1959. By 1962 the electrification of all the major railway lines in Kent would be completed, including the Maidstone and Ashford routes.

On the London to Hastings route diesel-electric multiple-unit trains would be introduced on 17th June next and would have superseded steam traction by 1958, giving an hourly service of fast trains (90 minute schedule) throughout the day.

GENERATION AND DEVELOPMENT

Higher London Charges

The London Electricity Board announced this week that higher costs have made it necessary for the Board to increase its tariffs. Many of these higher costs made themselves felt last year, but in view of the price freeze the Board withheld making any tariff revisions until now.

The increases, which have been made following consultation with the London Electricity Consultative Council, will be effective from the first normal meter readings after 31st May. They are calculated to provide in a full year an additional income of approximately 10 per cent.

The flat rates for lighting and heating supplies will be increased by ½d/kWh; small power and commercial water heating supplies will cost an additional ⅛d ⅛kWh; the primary "unit" charge of small power block rates will be increased by ¼d; the standing charges of the domestic two-part rate will be increased by 5d a week; and the running charge of the domestic tariff and of all commercial and small industrial two-part and similar tariffs, at present 1·1d/kWh, will be increased to 1¼d.

Industrial contract rates are increased in conformity with the bulk supply tariff to the Board. Appropriate increases will be made to industrial and commercial consumers whose supplies are subject to a fuel cost adjustment clause.

Electricity Boards' Sales

The latest return of Area Boards' sales completes the year that will be covered in the Central Electricity Authority's 1956-57 report, probably the last under the present constitution. As will be seen from the accompanying table, sales in that period totalled 72,426 million kWh, an increase of 5 per cent. The national figures for March show a decrease compared with March, 1956, of 0·6 per cent, but when corrected for weather conditions and working days, there was an increase of 3·1 per cent.

Large Rural Programme

The Merseyside and North Wales Electricity Board claims that its programme of rural electrification is the largest ever tackled in this country and that more farms and other rural premises have been connected to the electricity supply than in any other electricity area. The programme will take until 1968 to complete. This was stated by Mr. D. H. Kendon, chairman of the Board, at an open meeting of the Consultative Council held at Crewe on 17th April. Mr. Kendon said that aluminium conductors had been installed in some places instead of copper and the Board was now trying out the use of steel for 11 kV lines. Not only was this less expensive but its greater strength permitted longer spans. Because fewer poles were used expenditure was reduced.

Street Lamp Maintenance

As part of the general scheme to convert all street lighting in Wandsworth to electricity, the Borough Council has installed some 4,000 low-mounting lamp standards, up to 15ft in height. Routine maintenance of these standards is now being assisted by a battery-powered vehicle built by Sidney Holes Electric Vehicles, Brighton.

Powered by a D.P. battery of 24KA11 cells and with a capacity of 160 Ah, the "Manulectric Standon" vehicle travels anything from 10 to 18 miles a day throughout the borough while the operator works on 35 to 45 lamp standards.

The "Manulectric Standon" battery-powered vehicle which is being used in Wandsworth for street lamp maintenance

Exchange lamp units and other equipment are carried in a large locker and spares and equipment for the vehicle itself in a smaller compartment. There is also a water tank and a special bucket clip which holds the bucket secure while the vehicle is moving. An aluminium ladder extending to 15ft is carried on top of the two equipment lockers.

To facilitate efficient and economic working, all the lamp maintenance vehicles have recently been fitted with radio-telephones.

Supply to Iona

Another stage in the introduction of electricity to the Western Islands of Scotland was completed on 17th April by the North of Scotland Hydro-Electric Board with the laying of a submarine cable across the mile-wide Sound of Iona. The cable will carry electricity from Mull to Iona, where it is hoped to introduce electricity by the end of the year.

N.S.W. Hydro-Electric Scheme

The Metropolitan Water Board, Sydney, has approved a revised estimate of £1,837,825 for civil works it will undertake in connection with the Warragamba Dam hydro-electric scheme. In August, 1954, it adopted an estimate for these works of £815,000. A Board spokesman said that the original estimate was adopted before the Electricity Commission had given the Board detailed plans of the project. The final plans made necessary more work than the Board had expected. The president of the Board, Mr. J. W. Goodsell, said that the power station would be capable of generating 50,000 kW. It would use surplus water in the dam. The Commission had already accepted tenders for the supply of generators.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for March (million kWh)			Twelve Months' Totals Ended 31st March (million kWh)		
	1956	1957	Inc. or Dec. %	1955/6	1956/7	Inc. or Dec. %
London	650·0	620·9	− 4·5	6,703·8	6,867·1	+ 2·4
South Eastern	401·5	387·3	− 3·5	4,175·0	4,403·9	+ 5·5
Southern	484·9	489·3	+ 0·9	5,012·8	5,414·5	+ 8·0
South Western	247·3	243·0	− 1·7	2,565·6	2,737·1	+ 6·7
Eastern	638·7	639·2	+ 0·1	6,653·9	7,072·5	+ 6·3
East Midlands*	538·3	546·5	+ 1·5	5,733·7	6,053·9	+ 5·6
Midlands*	719·8	694·8	− 3·5	7,533·0	7,707·6	+ 2·3
South Wales*	404·3	421·7	+ 4·3	4,394·3	4,545·8	+ 3·4
Merseyside and North Wales*	418·6	421·5	+ 0·7	4,510·8	4,784·6	+ 6·1
Yorkshire*	710·2	706·9	− 0·5	7,471·3	7,876·3	+ 5·4
North Eastern*	395·2	397·6	+ 0·6	4,283·0	4,544·0	+ 6·1
North Western*	738·7	728·8	− 1·3	7,964·7	8,226·8	+ 3·3
Total all Area Boards	6,347·5	6,297·5	− 0·8	67,001·9	70,234·1	+ 4·8
Direct Supplies by Central Authority	185·8	193·4	+ 4·1	1,958·2	2,191·6	+11·9
Grand Total	6,533·3	6,490·9	− 0·6	68,960·1	72,425·7	+ 5·0
Mainly Industrial Areas*	3,925·1	3,917·8	− 0·2	41,890·8	43,739·0	+ 4·4
Mainly Non-Industrial Areas	2,422·4	2,379·7	− 1·8	25,111·1	26,495·1	+ 5·5

* Those in which industrial consumers took over 50 per cent of the total sales in the preceding financial year.

DOMESTIC ELECTRICAL EQUIPMENT

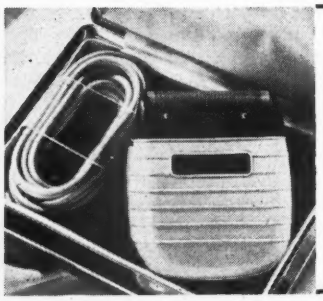
Dry Shavers

ALTHOUGH the number of users of electric dry shavers in this country is considerably less than in America and on the Continent, there are indications that more are now being sold. Possibly the public are becoming aware of the improved performance of the latest designs. An example is the latest Ronson model, with "super trim" which not only gives a complete shave but also deals with the moustache, neck hairs, etc. In addition, it is claimed to be the first self-cleaning shaver.

The number of manufacturers of dry shavers is not great if compared with the many firms engaged in the manufacture of other types of domestic appliances, but several makers include more than one model in their range. Most types are suitable for use on either a.c. or d.c. and cover a voltage range from 100 to 250 V. Battery models for either 6 or 12 V are available for car owners.

Since the last time we dealt with this subject in these surveys a "roller comb" head has been designed for the "Remington 60" range, and B. H. Ries, Ltd., announce the introduction of a new clipper head, interchangeable with the shaver head on the "Richard Cadet" model. Generally speaking, prices remain at much the same level as last year, apart from slight reductions, due to purchase tax changes, made by some manufacturers.

Manufacturer	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
ARVIN ELECTRIC, LTD., Fernbrook Avenue, Southend-on-Sea.	"Fernbrook"	Vibrator	10 oz	200/250 a.c.	New type synchronous pulsating motor. Stainless steel outer shear	Pale grey and burgundy plastic body. Rexine covered steel case	£6 0 1	£1 4 8
	"Consort"	Vibrator. Twin-head	9 oz	200/250 a.c.	Instantly detachable head. Self-aligning cutting shears	Ivory plastic body. Red presentation box	£3 4 0	£0 13 2
	"33"	Dual voltage motor. Triple-head	11½ oz	200/250, 100/125 or 12 V a.c./d.c.	"Rhomboid" inner shears. Detachable and interchangeable heads	Ivory and mushroom plastic body. Hide presentation case	£7 11 0	£1 11 0
CHILTON ELECTRIC PRODUCTS, LTD., Hungerford, Berks.	"Kub"	Vibrator	12 oz	210/250 a.c.	Voltage control allows adjustment for drop in mains supply	Light and dark grey "Diakon" casing	£3 7 7	£0 14 10
	"Buk"	Vibrator	14 oz	210/250 a.c.	Voltage control. On/off switch	Ivory urea casing	£4 15 0	£1 2 4
	"Twin"	Vibrator	14 oz	210/250 a.c.	Voltage control. On/off switch	Ivory urea casing	£5 6 7	£1 3 5
INGLIS KNIBB & CO. Tooks Court, Cursitor Street, London, E.C.4.	"Unic" 54	Vibrator	11 oz	200/250 a.c.	Side trimmers	Cream plastic	£4 16 6	£1 1 0
	"Unic" Century	Single and dual voltage motor	11 oz	200/250 a.c. and 110/125 and 220/250 a.c./d.c.	Side trimmers	Cream plastic	£5 10 10 (single voltage) £5 14 10 (dual voltage)	£1 4 2 (single voltage) £1 5 0 (dual voltage)
	"Unic" Super Vedette	Single and multi-voltage motor	11 oz	200/250 a.c. and 110/125, 125/140, 145/165, 200/250 a.c./d.c.	—	Cream plastic	£8 13 6 (single voltage) £9 3 6 (multi-voltage)	£1 16 10 (single voltage) £2 2 6 (multi-voltage)
	"Unic" Autoshaver	Impulse motor	11 oz	12 V	Suitable for operation from car battery	Cream plastic	£8 10 4	£1 18 4
	"Unic" Selection	Impulse motor	15 oz	110/125, 125/140, 145/160, 200/250 a.c./d.c.	Extra large shaving head	Cream plastic	£12 3 6	£2 9 6

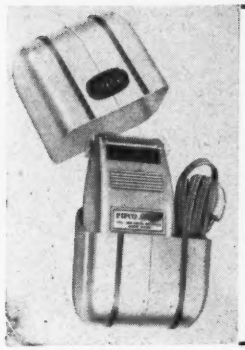


1

2

3

4



5

6

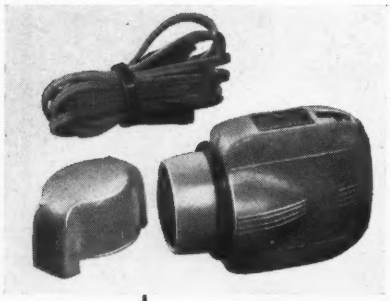
7

8

9

1. *Arvin "Fernbrook"*
2. *Arvin "Consort"*
3. *Philips "Philishave" battery model*
4. *Philips "Philishave" mains model 7778*
5. *Pifco shaver*
6. *Remington "Super 60"*
7. *Chilton "Buk"*
8. *Chilton "Kub"*
9. *Remington "Four-Most"*

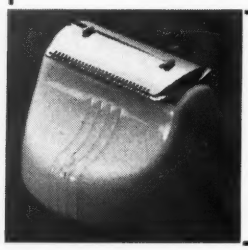
Manufacturer	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2.	"Philishave" 7743	Mains operated, dual voltage	8¼ oz	110/130–200/250 a.c./d.c.	Rotary action. Slide-switch for voltage adjustment	Cream plastic	£6 4 11	£1 9 3
	"Philishave" 7749	Battery operated	8¼ oz	3 1½ V batteries or, by special adaptor, 6 or 12 V car batteries	Rotary action	Maroon plastic	£6 4 0	£1 8 6
	"Philishave" 7778	Standard single voltage	8¼ oz	200/250 a.c./d.c.	Rotary action	Cream plastic	£5 11 7	£1 5 11
PIFCO, LTD., Pifco House, Watling Street, Manchester, 4.	"Pifco" 1126	Vibrator	9⅛ oz	200/250 and 100/110 a.c.	Wafer-thin cutting head. Complete in plastic container	Cream plastic	£3 6 10	£0 14 8
REMINGTON-RAND, LTD., 26-40, Kensington High Street, London, W.8.	"Super 60" De-Luxe Regular	Double insulated impulse motor	10¼ oz	210/240 a.c./d.c.	"Roller combs," spring loaded cutters, contour curved multiple heads	Two-tone grey plastic, suede covered presentation case	£8 6 0	£1 15 3
	"Super 60" De-Luxe Triple-Volt	Double insulated impulse motor	10⅛ oz	110/130, 140/160 and 190/240 a.c./d.c.	"Roller combs," spring loaded cutters, contour curved multiple heads, voltage change switch	Two-tone grey plastic, suede covered presentation case	£9 3 0	£1 18 11



10

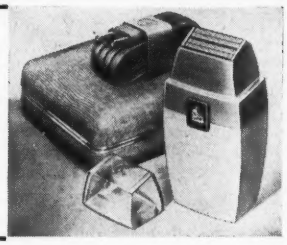
12

13



11

10. *B. H. Ries "Richard Cadet"*
11. *Clipper head for the Richard Cadet shaver (B. H. Ries)*
12. *Ronson shaver with "Super Trim"*
13. *Sunbeam "Shavemaster" W-ZA*
14. *"Rolls Viceroy" V-Ten shaver*



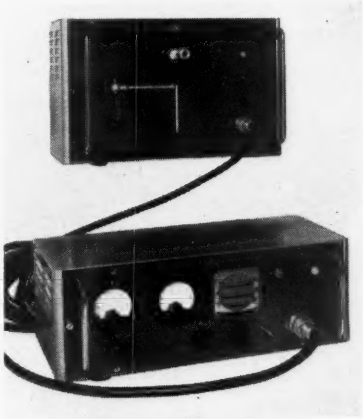
14

Manufacturer	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
REMINGTON-RAND, LTD., 26-40, Kensington High Street, London, W.8. *(continued)*	"Super 60" De-Luxe Auto-Home	Double insulated impulse motor	10½ oz	6 or 12 and 110/125 or 6 or 12 and 210/240 a.c./d.c.	Complete with dashboard fitting for car use	Two-tone grey plastic, suede covered case	£9 9 0	£2 0 2
	"Four-Most"	Double insulated vibrator motor	10½ oz	110/150 and 210/240 a.c.	Dual-volt change switch, contour curved shaving heads	Two-tone grey plastic, real hide carrying case	£5 13 4	£1 16 2
B. H. RIES, LTD., 19-21, Hatton Garden, London, E.C.1.	"Richard Supershaver"	Rotary and clipper heads	12 oz	110/130, 200/250 a.c./d.c.	Enlarged shaving head plus trimming head	"Perspex" body. Leather zip pouch	£7 15 5	£1 13 7
	"Richard Cadet"	Rotary head	10 oz	110/130, 200/250 a.c./d.c.	Clipper head available 25/- extra	Grey nylon body	£5 15 4	£1 3 8
ROLLS RAZOR, LTD., 255, Cricklewood Broadway, London, N.W.2.	"Rolls Viceroy" A.C.	Vibrator	10½ oz	200/250 a.c.	Self-starting. Lamp adaptor supplied	Maroon plastic body	£4 10 0	£0 19 9
	"Rolls Viceroy" V-Ten	Impulse motor	12 oz	90/250 a.c./d.c.	Angled multi-heads, on/off and voltage change switches. Lamp adaptor supplied	Coffee and deep cream plastic body. Silk and velvet lined case	£8 5 0	£1 16 3
	"Rolls Viceroy" A.C.-Four	Vibrator	10¾ oz	100/130 and 200/250 a.c.	Multi-heads, on/off and voltage change switches	Beige and maroon plastic body. Travelling case	£6 2 2	£1 6 10
RONSON PRODUCTS, LTD., 352-3, Strand, London, W.C.2.	"Ronson with Super Trim"	Vibrator	9¼ oz	100/125 and 200/250 a.c.	On/off switch, transparent guard, cool running, trims as well as shaves	Cream moulded body, chromium head, presentation case	£7 6 8	£1 10 10
SUNBEAM ELECTRIC, LTD., Nerston, East Kilbride, Lanarkshire.	"Shavemaster" W-ZA	16-bar armature motor	12 oz	210/250 a.c./d.c.	5-year guarantee. Single hollow ground oscillating cutter	Grey plastic and highly buffed steel alloy	£8 16 5	£1 18 9
	"Shavemaster" W-RA	16-bar armature motor	12 oz	100/140, 190/250 a.c./d.c.	5-year guarantee. Single hollow ground oscillating cutter. Dual voltage	Grey plastic and highly buffed steel alloy	£9 13 5	£2 2 5

NEW ELECTRICAL EQUIPMENT

Ionisation Tester

AIRMEC, LTD., High Wycombe, Bucks, have recently announced the introduction of an improved 20 kV ionisation tester. The advantages of using this set over "flash" tests include the facility for grading components such as capacitors, the ability to determine the safe working voltage of components, and the provision of information on the insulating properties of a dielectric.



Airmec ionisation tester

The tester (Type 209) indicates the ionisation threshold voltage of insulation up to 20 kV. A d.c. voltage, continuously variable from 2·5 kV to over 20 kV, is available for applying to the insulation under test.

The tester is constructed in two separate units, the e.h.v. unit which provides the test voltage and the control unit which contains the controls, indicators and mains power pack. Both units are contained in standard steel cases suitable for forward mounting on a standard 19in rack or for bench use.

Plug-In Relay

A special plug-in relay (type DA2600) developed by CLIFFORD & SNELL, LTD., is a robust unit measuring 2⅛in by 3¾in by 4¾in and when plugged in is held securely by special pinch-type contacts in the socket; it has a moulded "Perspex" cover for protection against dust and accidental damage during maintenance. Coils are available for up to 400 V a.c. or 250 V d.c. and up to 8in N/O or N/C, of four C/O or K action (make-before-break) 5 A contacts can be fitted.

The sockets are slotted and can be slid on to mounting frames made in various sizes to take any number of relays. The frames can be wired up as a light bench job before fitting to the equipment, and can be fixed across open racks or on to a flat surface as all wiring can run within the frame.

This development provides a solution to the problem of providing relay facilities in industrial electrical equipment, where it has long been necessary to use skeleton-type relays, usually awkward to install and easily damaged. The most important feature to the user is the rapid circuit isolation that results from unplugging these relays. This can greatly expedite the location of a fault in any part of the equipment. The relay is distributed by D. Robinson & Co., 58, Oaks Avenue, Worcester Park, Surrey.

Hoover "Mark IV" Motor

A new range of general purpose squirrel cage induction motors, designed to conserve material and reduce weight, is being manufactured by HOOVER (ELECTRIC MOTORS), LTD., Cambuslang, Lanarkshire. The dimensions conform to B.S. 2048/1953 and the electrical performance to B.S. 170/1939.

This new motor, the "Mark IV," is available in a horse-power range from about $\frac{1}{10}$ to $\frac{1}{4}$ (four-pole, 50 c/s). The diameter is slightly less than 5¾in whilst the weight of the ¼ h.p. size, for example, is only 19 lb. Several types of mounting are available, including solid foot, resilient, flange and lug.

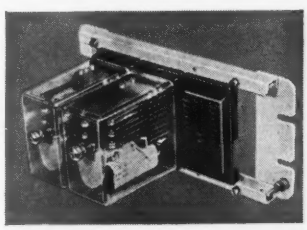
Telephone Amplifier

A battery operated self-contained instrument for electronically amplifying incoming speech has been introduced by CECO PRODUCTS, 19a, Whittall Street, Birmingham, 4. This instrument, known as the "Auditel," allows both hands to be free for note-taking whilst carrying on a conversation and also permits more than one person to take part in discussions simultaneously.

On receiving a call the telephone handset is placed on the "Auditel" as illustrated. This automatically switches on the amplifier and speech is directed towards the acoustic panel in the front. The incoming speech volume may be adjusted by means of the control to the right of the cabinet and is amplified to a comfortable room volume.

The circuit incorporates miniature high efficiency valves powered by dry batteries of 67½ and 1½ V. Current consumption is of the order of 75 mA l.t. and 6 mA h.t.

Clifford & Snell DA2600 plug-in relay

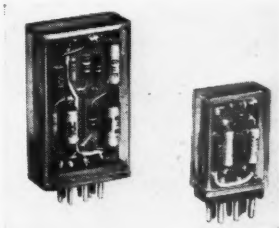


Transistorised Amplifier

Two types of transistorised amplifier have just been produced by VENNER ELECTRONICS, LTD., Kingston By-Pass, New Malden. The first is intended for frequencies in the audio range and has a response flat within 3 dB from 120 c/s to 10 kc/s. The second type is intended for industrial applications and has a response within 3 dB from 15 c/s to 132 kc/s.

Voltage gains of the amplifiers are between 900 and 1,000 and each consists of two stages which may be used separately or in cascade, individual stage gains being of the order of 60. They are each RC coupled and employ temperature compensation circuits to give satisfactory working from −10 deg C to +50 deg C.

Both are designed to work from a nominal 10 V supply, the maximum undistorted output being 2 V r.m.s., but they will function with supplies from 1·5 V d.c. to 12 V d.c. Their applications are numerous and they may be expected to have a working life greatly in excess of an equivalent valve amplifier.



Venner Electronics transistorised miniature amplifiers. Type TS4 (left) weighs 1½ oz and Type TS3 ¾ oz

Ceco Products "Auditel" telephone amplifier

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets failed to reproduce in the second half of April the form displayed in the first part of the month. For a mildly reactionary tendency among industrial shares, foreign affairs were held mainly responsible. At the same time, the recent company news has not provided a great deal of inspiration. Of the several industrial giants which have announced their dividends and results for 1956 during the last week or so, Imperial Chemical Industries reported an increasingly familiar experience: a good increase in turnover during last year left the trading profit virtually unchanged, while heavier provisions for depreciation and taxation made a quite considerable reduction in the net figures. The dividend is comfortably maintained. Among other company results, the fall in the earnings of Babcock & Wilcox drew attention. In the gilt-edged market, prices reflected a revival of the expectation that a further reduction in Bank Rate may not now be long delayed.

English Electric Issues

Allotment letters were due to go out to-day (Friday) to the ordinary shareholders of English Electric, offering them rather more than three million new shares in the proportion of one, at a price of 50s, for every five held. At the same time, application lists open to the company's debenture, preference and ordinary stockholders for the £9 million 5½ per cent debenture stock 1977–82, at 97. Together these issues will raise approximately £16 million of new money, a figure roughly in line with the amount of the bank overdrafts appearing in the company's last balance sheet. Following the announcements, the market in the existing ordinary shares remained very firm. Apart from satisfaction with the method and terms of the operation, the market was impressed by reports that the offers would be accompanied by a statement emphasising the rate at which the group's business is expanding, and indicating the maintenance of the dividend at 14 per cent on the increased capital. With the old shares quoted previously at 60s, the new were expected to open at a premium of around 8s 3d on the issue price.

Brush and Hawker Siddeley

Terms of the Hawker Siddeley Group's offer for the Brush Group's capital have reacted very favourably upon the value of the latter company's shares. In comparison with prices ruling at the time of the last month's decision to pay no ordinary dividend for 1956, Brush 5s ordinary shares have risen from under 5s to over 7s; the 5½ per cent preference from 14s 6d to 17s 6d; and the 6 per cent preference from 17s 6d to 28s 6d. Apart from offering relief from the Brush Group's intractable capital problem, the proposal promises to those who accept it an early return to ordinary dividends

Price Changes in

Company or Board	Nom. Value	Middle price 29th April	Three Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	77½		3	3	3 17 6	80	75
Brit. Elec. 1974/77	100	75½		3	3	3 19 6	78½	73½
Brit. Elec. 1976/79	100	78½		3½	3½	4 9 3	81½	77½
Brit. Elec. 1974/79	100	89½		4¼	4¼	4 15 0	92½	87½
Overseas Electric Supply								
Calcutta Elec.	£1	18/-	—6d	6†	6†	6 13 3†	19/-	18/3
East African Power	£1	21/-	+1/-	7	7	6 13 3	21/-	19/3
Nigerian Elec.	£1	17/6		10	10*	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	16/6	+1/6	10	10*	12 2 6	16/6	13/3
Electrical Shares								
Aberdare Cables	5/-	12/6	+2/3	17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	5/9	+3d	45	48	8 6 9	6/-	4/9
Allen, W. H.	£1	42/6	+2/6	20	10*	4 14 3	42/6	33/6
Anglo-Portuguese Tel.	£1	25/9	+2/-	8	8	6 4 3	25/9	20/6
Aron Elec. Ord.	£1	56/3		15	15	5 6 9	56/3	53/6
Assd. Automation	10/-	23/3	+3/3	10	5	2 3 0	22/3	17/9
Assoc. Elec. Ord.	£1	67/6	+1/3	15	15	4 9 0	73/-	62/6
Automatic Tel. & El.	£1	67/6	+5/-	15	17	5 0 9	68/9	54/6
Babcock & Wilcox	£1	78/9	−1/3	15	15	3 16 3	82/6	71/6
Bakelite	10/-	24/6	+3d	16	15	6 2 6	24/6	20/9
Baldwin, H. J.	2/-	4/3	−3d	20	20	9 8 3	5/-	4/
Berry's Electric	5/-	5/9		—	10‡	8 14 0	5/9	5/6
British Aluminium	£1	70/-	+1/3	12	12	3 8 6	70/6	63/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	21/6	+1/-	22½	22½	5 4 9	21/6	17/-
B.I. Callender's	£1	55/-	+2/9	12½	12½	4 11 0	55/-	48/3
B.I. Callender's 6% Pref.	£1	21/6	−3d	6	6	5 11 6	21/9	20/6
British Tabulating	£1	53/6	+1/6	9	9	3 7 3	53/6	42/-
British Thermostat	5/-	27/-		20	25	4 12 6	27/6	25/9
British Vac. Cleaner	5/-	8/-	+1/-	30	15*	9 7 6	8/-	6/6
Brook Motors	10/-	32/6	+1/3	25	25	7 13 9	33/3	30/-
Brush Group	5/-	7/-	+1/3	10	Nil	Nil	7/3	4/6
Bulgin, A. F.	1/-	5/-		50	40*	8 0 0	5/6	4/6
Burco Dean	5/-	12/-	+9d	22½	20	8 6 9	12/-	8/9
Cable & Wireless: Ord.	5/-	11/6	+3d	10	10	4 7 0	12/-	9/6
4% Loan	100	92½		4	4	4 6 6	92½	89
Chloride El. Storage "A"	£1	68/3	+1/6	17½	17½	5 2 6	68/3	58/-
Clarke Chapman	£1	162/6	+10/-	22½	27½	3 7 9	8¼	6¼
Cole, E. K.	5/-	20/6	+6d	17½	17½	4 5 3	20/6	16/6
Cossor, A. C.	5/-	6/6	−3d	15	Nil	Nil	7/3	5/9
Crabtree	10/-	25/6	+1/-	20	20	7 16 9	25/6	23/3
Crompton Parkinson Ord.	5/-	16/3		16	16	4 18 6	17/9	14/6
De La Rue	5/-	19/6	+1/-	30	30	7 13 9	19/9	16/3
Decca "A"	4/-	28/3	—1/-	43¾	43¾	6 4 0	32/3	27/-
Desoutter	5/-	32/-	+1/-	30	32½	5 1 6	32/-	27/6
Dewhurst	2/-	7/-	+6d	30	16½*	4 12 9	7/6	5/9
Dictograph Tel.	2/-	7/6	+6d	20	20	5 6 9	7/6	6/9
Dubilier Condenser	1/-	5/6	+3d	25	30	5 9 0	5/9	5/6
Duport	5/-	18/6		23	25	6 15 3	19/6	17/6
E.M.I.	10/-	31/6	−1/-	15	15	4 15 3	32/6	23/9
Electrical Components	5/-	7/6	+3d	25	25	8 6 9*	7/6	6/6
Elec. Construction	£1	26/3	+1/3	8½	8½	6 9 6	26/3	21/9
Elliott Bros.	5/-	27/6		17½	20	3 12 9	29/-	26/3
Enfield Cable Ord.	£1	15/3	−1/3	Nil	Nil	Nil	21/6	13/-
English Electric	£1	60/-	+1/3	12½	14	4 13 3	60/-	47/6
English Electric 3¾% Pref.	£1	13/-		3¾	3¾	5 15 6	14/3	13/-
Ericsson Tel.	5/-	44/6	+3/6	20†	22†	2 9 6†	44/6	33/3
Ever Ready	5/-	31/9	+3d	35	35	5 10 3	31/9	30/-
Falk Stadelmann	£1	39/-		17½	17½	8 19 6	38/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

and a stake in an organisation which is expanding vigorously into fields beyond the aircraft industry, both in this country and in Canada. For the 5s ordinary shares, the offer is of one new £1 Hawker share for every five held. The new shares will be entitled to the dividends of 10 per cent which Hawker propose to pay this year, and which will give the equivalent of 8 per cent on the Brush shares converted. Thomas Tilling have declared their intention of accepting the offer for their substantial investment in Brush.

Electrical Investments

Company or Board	Nom. Value	Middle price 29th April	Three Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	57/6	+1/3	12½	14	4 17 3	57/9	48/9
G.E.C. 6½% Pref.	£1	22/-	−6d	6½	6½	5 18 3	23/6	22/-
General Cables	5/-	12/9		30	30	11 15 3	13/6	11/6
Greenwood & Batley	£1	46/3		17½	17½	7 11 3	46/3	45/3
Hackbridge Holdings	5/-	21/9	+6d	25	30	6 18 0	21/9	19/9
Hackbridge & Hewittic	5/-	15/-		30	23*	7 13 3	16/-	13/6
Head Wrightson	£1	132/6		17½	20	3 0 6	132/6	112/6
Heatrae	2/-	4/-		15	15	7 10 0	4/-	4/-
Henley's	10/-	16/6		11½	11½	6 19 6	17/-	15/3
Holophane	5/-	23/3	+3d	30	30	6 9 0	26/3	17/-
Hoover	5/-	37/6		50	50	6 13 3	39/-	24/9
I.C.I.	£1	44/-	−9d	10	10	4 11 0	44/9	37/9
Intl. Combustion	5/-	27/6	+6d	20	22½	4 1 9	27/6	20/-
Johnson & Phillips	£1	30/-		15	15	10 0 0	34/6	28/6
Lancashire Dynamo	£1	43/9		11	11	5 0 6	45/-	36/9
Laurence, Scott	5/-	18/3		12½	15	4 2 3	18/3	13/9
Lister, R. A.	£1	30/-	+9d	9·3	10	6 13 3	30/6	26/9
London Elec. Wire	£1	53/9		12½	12½	4 13 0	53/9	43/-
Lucas, J.	£1	36/3	+1/3	7½	7½	4 2 9	36/3	30/6
Marconi Marine	£1	33/9	+3d	10	10	5 18 6	33/9	31/-
Marryat & Scott	2/-	9/3		30	30	6 9 9	9/6	8/-
Mather & Platt	£1	59/-	+3/-	15	15	5 1 9	59/-	51/3
Metal Industries	£1	25/6	−9d	9	Nil	—	26/3	20/3
Midland Elec. Mfg.	£1	48/9	+1/3	12½	12½	5 2 6	48/9	45/-
Morphy-Richards	4/-	16/6	+1/6	50	50	4 17 0*	16/6	11/9
Murex	£1	74/6		20	20	5 7 6	74/6	65/-
Newman Ind.	2/-	2/9	+3d	10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/6		20	17½*	7 0 0	2/6	2/3
Parnall (Yate)	5/-	8/3	+3d	12	12	7 5 6	8/3	5/9
Parsons, C.A.	£1	71/3	+2/6	10	10	—	71/3	50/6
Plessey	10/-	78/6	+1/6	27½	30	3 16 6	79 -	61/-
Pye "A" Deferred	5/-	18/3	+3d	12½	12½	3 8 6	18/3	15/9
Reyrolle	£1	105/-		16½	17½	3 6 9	110/-	90/-
Rheostatic	4/-	10/-		18¾	12½*	5 0 0	10/-	8/9
Richardsons Westgarth	5/-	19/-		16¾	16¾	4 7 9	19/-	17/-
Scottish Cables	4/-	18/3	+6d	27½	27½	6 0 6	19/3	15/-
Simon-Carves	5/-	30/-		30	28¾*	—	30/9	26/-
Smith (England), S.	4/-	15/-	+6d	17½	17½	4 13 3	15/-	13/-
Southern Areas	£1	18/9	+1/3	10	7½	8 0 0	20/-	13/9
Strand Elec.	5/-	7/9	+3d	15	15	9 13 6	8/-	7/3
Sturtevant	5/-	27/-	+1/-	15†	15†	2 15 6†	27/-	24/3
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	14/9	+6d	25	25	8 9 6	15/6	13/6
Taylor Tunnicliff	5/-	13/3		15	15	5 13 3	13/9	11/9
T.C.C.	10/-	38/9		25	25	6 9 0	38/9	35/-
T.C. & M.	£1	30/9	+2/9	8½	8½	5 10 6	31/-	24/6
Telephone Mfg.	5/-	7/6		10	10*	6 13 3	7/6	6/3
Telephone Rentals	5/-	12/6	+9d	12½	12½	5 0 0	12/6	10/3
Thompson (John)	5/-	33/3	+6d	25	25*	3 15 3	37/-	29/3
Thorn Elec.	5/-	23/3	+1/3	15	15	3 4 6	23/3	16/3
Thornycroft	£1	37/6		15	12½	6 13 3	37/6	32/9
Tube Investments	£1	65/9	+9d	22½	15*‡	4 11 3	65/9	58/3
Vactric	5/-	18/9		15	17½*	4 13 3	18/9	12/9
Veritys	5/-	9/-	+9d	12½	12½	6 19 0	9/3	8/3
Walsall Conduits	4/-	14/3	+9d	70	20*	5 12 3	14/3	11/-
Ward & Goldstone	5/-	47/6	+3/3	30	35	3 13 9	48/9	36/9
Watford	2/-	6/6		25	25	7 13 9	6/6	6/3
Westinghouse	£1	41/3x.r.		18	9‡	4 7 3	41/3	36/-
West, Allen	5/-	16/6	+2/3	15	15	4 11 0	16/6	12/3
Wolf Electric	5/-	21/-	+1/6	20	20	4 15 3	21/-	17/3

Babcock & Wilcox

Babcock & Wilcox £1 shares were quoted a shilling or so below their recent best after the announcement of an unchanged final dividend, making a total of 15 per cent for 1956, and of the drop of about a million in the group profit. The latter, at £3·7 million before tax, is some 22 per cent under the previous figure. After tax, there is a net surplus of just over £1½ million, which appears to give more than twofold cover for the amount of the ordinary dividend, and better than threefold cover if an additional depreciation provision of nearly £800,000 is excluded from the calculation. In advance of the full annual report, it was assumed that the influence of rising costs and smaller profit margins had been at work on the group's earnings. The yield on the shares remains below the 4 per cent mark.

Price Changes

In the accompanying list of electrical shares, prices are compared, this time, with those ruling three weeks ago, or shortly before Budget Day. The comparisons show that despite a certain amount of recent wavering, the general line was appreciably advanced during this period. Several outstandingly good performances from individual shares were connected as a rule with news from the companies concerned: the respective rises of 5s and 3s 6d in Automatic Telephone and Ericsson Telephone, for instance, were based on the good results reported earlier by both companies. Allen West, up by 2s 3d to 16s 6d, have been strongly supported since the news of higher earnings in 1956 and of a proposed scrip issue; the dividend is being maintained at a well-covered 15 per cent. Shares of the electrical companies in the major nuclear power groups mostly secured net gains of between one or two shillings. In the engineering sections, Clarke Chapman put on yet a further 10s to 162s 6d.

Cable Group

Shares of the principal cable manufacturing companies have maintained their value despite the lower trading profits reported during the past month by B.I.C.C., W. T. Henley's, London Electric Wire and Aberdare Cables. All four are paying dividends at the same rate as for last year. British Insulated indeed moved up to their best price of the year at 55s. Aberdare Cables and Telegraph Construction acted similarly well, advancing to 12s 6d and 30s 9d respectively. In other parts of the market, Ward & Goldstone were marked up from 44s 3d to 47s 6d (after reaching 48s 9d) and there were also gains of note in Plessey, Lucas and Mather & Platt. A rise of 1s 6d in Perak Hydro Electric appeared to be connected with the tax reliefs to companies trading overseas.

REPORTS and DIVIDENDS

The English Electric Co., Ltd., is making issues of debenture stock and ordinary shares. Holders of debenture, preference and ordinary stock are invited to subscribe for £9,000,000 of 5½ per cent debenture stock, 1977-82, at a price of £97 per cent, and ordinary stockholders are also offered 3,044,344 £1 ordinary shares at 50s each on the basis of one for every five held. The two issues will raise £16 million for the repayment of bank indebtedness and for working capital. The shares will carry the right to all dividends for 1957 which the directors expect will be maintained at 14 per cent on the enlarged capital.

Elliott Brothers (London), Ltd.—The preliminary figures for 1956 show a profit before taxation (excluding the Associated Insulation Products, Ltd., group, acquired in November last) of £292,818, as compared with £260,685 for 1955. The profit of Associated Insulation Products is £272,798, making a combined group profit of £565,616. Taxation absorbs £325,074, leaving a net balance of £240,542 (£145,685). It is proposed to pay a final ordinary dividend of 10 per cent on increased capital, which with the interim of 10 per cent on smaller capital, makes 20 per cent for the year. For the previous year the total dividend was 17½ per cent. The balance carried forward is £106,105 (against £92,088 brought in).

The Telegraph Construction & Maintenance Co., Ltd.—The report and accounts for 1956 show earnings of the group of £715,388, as compared with £726,359 for 1955. After deducting depreciation and other charges, and adding income from investments, etc., there is a profit, before taxation, of £496,119 (against £536,530). Taxation requires £280,449, leaving a net profit of £215,670 (£252,375). After making various adjustments, the balance attributable to the parent company is £226,677 (£286,959). Reserves receive £35,000 and it is proposed to pay a final ordinary dividend of 3¾ per cent, and a cash bonus of 1 per cent, making 8½ per cent for the year. A similar distribution was made in 1956, but in that year the interim dividend was on smaller capital. The consolidated balance carried forward is £228,966 (against £197,048 brought in).

In his statement, which accompanies the report and accounts, Sir John Dean (chairman) says that they have recently arranged to acquire the whole of the issued capital of A. W. A. Telcon Pty., Ltd., in which hitherto they have held a minority interest in partnership with other Australian companies. The decline in profit is almost entirely confined to the cables division, which still provides a large proportion of their business. In this division, despite substantial orders for many types of cable, the effect of keen prices on profits has been aggravated by the very marked drop in the price of copper during the year from a maximum of about £430 per ton to a figure of £260 per ton at 31st December.

With the sole exception of the cables group, all sections of the company have operated in a satisfactory and profitable manner. The metals group is still seriously short of nickel, but has nevertheless had an excellent year. The plastics division has also done well. Their reorganisation and expansion plans are now nearly completed, but they were not able to take anything like full advantage of the new machinery because of delays in getting it into full production. They have started the current year with a satisfactory order book.

The outstanding event of 1956 was the successful completion of the manufacture of 92 per cent of the cable required for the first transatlantic telephone system inaugurated in September last. This cable was produced at the Erith Works of the associate company, Submarine Cables, Ltd., which they own jointly with Siemens Brothers & Co., Ltd. The *Ocean Layer* has had a busy year. The sales division has consolidated its position at home. Overseas, their reputation has been fully maintained, and the improvement in sales has been largely due to the co-operation of the subsidiary companies and agents and associates overseas and to their sales division.

The Harland Engineering Co., Ltd.—The group net profit for 1956 is £77,395, as compared with £96,235 for the preceding year, to which is added a surplus on realisation of assets of £3,547 and £15,000 taxation provisions no longer required. Plant replacement reserve receives £50,000 and it is proposed to pay a final dividend of 8 per cent on £400,000 ordinary capital, making 12 per cent for the year. For the previous year a total of 14 per cent was paid on capital of £300,000. The balance carried forward is £65,976 (against £61,494 brought in).

Switchgear & Cowans, Ltd.—Mr. J. L. Rowbotham (chairman) said at the company's annual meeting on 26th April that conditions last year had been the most difficult since the end of the war, the monetary restrictions imposed in the early part of the year having seriously interfered with the production programme owing to the deferment of deliveries by customers, often on partly manufactured orders. Regarding the current year, he said that while the order book for the main factory and the subsidiaries was reduced in comparison with a year ago, the rate of input had so far been satisfactory. In consequence work was taken on with much shorter deliveries. The organisation of the factory was sufficiently flexible to enable them to handle the work quickly on this basis.

A considerable amount of research and development work would be carried out during 1957, among which they were including new and improved designs with export markets especially in view.

Babcock & Wilcox, Ltd., report a group profit, before taxation, for 1956 of £3,668,461, as compared with £4,728,418 for the previous year. Taxation requires £2,121,245, and the net profit is £1,547,216 (against £2,239,809), to which is added capital profits of £140,747 and unrequired taxation of £103,313, making £1,771,904 available to the parent company. The ordinary dividend for the year is maintained at 15 per cent by a final payment of 8 per cent.

Hopkinsons, Ltd.—Profits for the year ended 31st January last amounted to £865,822, as compared with £876,541 for the preceding year, and after providing £445,000 for taxation, the net profit is £420,822 (against £455,541). A sum of £300,000 is placed to general reserve, and it is proposed to pay a final dividend of 20 per cent (against 17½ per cent), making 30 per cent (27½ per cent), for the year. The balance carried forward is £540,239 (against £570,443 brought in).

Blaw Knox, Ltd.—The main figures in the accounts were given in our issue of 12th April. In his circulated statement, Mr. J. M. Wallace (chairman) says that orders for transmission towers, particularly at home, continue to rise. Steel deliveries, however, have not come up to expectations, although there are indications that there should be some improvement over the next twelve months. After a lapse of years they have obtained orders from Canada, and for the first time since before the war they have obtained a contract for the supply of towers in Australia, based on local manufacture. They have also received further orders from Norway and Pakistan.

Parnall (Yate), Ltd., report a profit for 1956 of £374,629, as compared with £548,564 for 1955, and after meeting all charges, including £117,500 for taxation, the net profit is £135,752 (against £235,447), to which is added £30,000 taxation over-provided. Reserve for contingencies receives £100,000 and the dividend for the year is maintained at 12 per cent, leaving a balance to be carried forward of £347,009 (against £333,007 brought in).

The Ever Ready Trust Co., Ltd., reports a revenue balance for the year to 31st March last of £93,274, as compared with £81,726 for 1955-56, subject to taxation of £43,320. It is proposed to pay a final dividend of 8 per cent, making 14 per cent for the year on capital increased by a 50 per

cent free scrip issue. The total dividend for the previous year was 12½ per cent. A rights issue is to be made on the basis of one new 5s share for every five stock units held.

The Power Investment Corporation, Ltd., reports a net revenue for the year ended 31st March last of £45,928, as compared with £53,305 for the preceding year. It is proposed to pay a final ordinary dividend of 6 per cent, making 9 per cent for the year (against 8 per cent).

G. & J. Weir, Ltd., has received the consent of the Capital Issues Committee to the proposed issue of 8,073,228 ordinary shares of 5s each as capitalisation of reserves.

Contactor Switchgear, Ltd., has declared an interim dividend of 6 per cent (unchanged).

Turner & Newall, Ltd., are paying an unchanged interim dividend of 5 per cent.

New Companies

Raven Electrics, Ltd.—Registered 8th April. Capital £1,000. Manufacturers of and dealers in electrical apparatus and equipment, radio and television apparatus, etc. Directors: R. L. F. Raven and Mrs. Gwendolyne M. Raven. Regd. office: 168, Bowes Road, N.11.

Distler, Ltd.—Registered 9th April. Capital £10,000. Electricians, electrical, electronic, telegraphic, telephonic, radio, television, mechanical, automobile and general engineers, etc. Directors: B. H. Wallis and A. E. Johnson. Regd. office: Horsham Trading Estate, Walton-on-Thames, Surrey.

A'ac Electrical Products, Ltd.—Registered 8th April. Capital £500. Manufacturers of and dealers in electric blankets, bedwarmers, heaters, stoves, cookers, irons, etc. Directors: A. C. Abbott and J. S. Wolstenholme. Regd. office: 7, Morley Road, Llandudno.

R. G. Humphreys, Ltd.—Registered 8th April. Capital £2,000. Electrical equipment specialists, manufacturers of and dealers in batteries, accumulators, magnetos, dynamos, etc. Directors: R. G. L. Humphreys and Mrs. Phyllis M. Humphreys. Regd. office: Station Road, High Wycombe, Bucks.

Stanley & Tibbs, Ltd.—Registered 19th February. Capital £1,000. Manufacturers of and dealers in electrical, mechanical and electronic equipment and appliances, etc. Directors: S. McGregor, C. E. M. Tibbs, E. C. Stanley and J. F. Cullingham. Regd. office: 42, Bedford Avenue, W.C.1.

Tunewell Transformers, Ltd.—Registered 8th April. Capital £2,000. Electrical equipment specialists, manufacturers of and dealers in batteries, accumulators, magnetos, dynamos, plugs, transformers, etc. Directors: G. C. Turner, J. B. Turner and Mrs. Constance Turner. Regd. office: 54, Station Road, N.11.

Cromwell's Marketing Co., Ltd.—Registered 8th April. Capital £500. Manufacturers, installers, fitters, maintainers of, agents for and dealers in electrical appliances, radio and television sets, etc. Directors: D. Cromwell and M. L. Cromwell. Regd. office: 197, Manchester Road, Bradford, 5.

Electronic Installations (Altrincham), Ltd.—Registered 8th April. Capital £100. Electrical and electronic engineers, etc. Directors: C. D. S. Gaskill and R. J. Roberts. Regd. office: 118, Ashley Road, Hale, Ches.

Burton & Sherwood, Ltd.—Registered 9th April. Capital £6,000. Electrical engineers and general electrical installation contractors, radio and television engineers, etc. Directors: D. W. Burton and K. J. Sherwood. Regd. office: 16, High Street, Warsop, Mansfield.

Coghlan & Robinson, Ltd. — Registered 9th April. Capital £1,000. Manufacturers of and dealers in artificial lighting apparatus, electrical plant, machinery, etc. Directors: P. T. W. Coghlan and F. A. Robinson. Regd. office: 32c, Waverley Road, Liverpool.

Bankruptcies

E. W. White, 5, Greenfield Road, Southmead, Bristol, electrical contractor.—First and final dividend of 4s 11/16d in the £, payable at the offices of E. T. Collins & Son, 28, Baldwin Street, Bristol, 1.

G. E. Loughlin, residing at Flat 6, 13, Nile Street, Hull, electrician, lately carrying on business in co-partnership under the style of Central Heating, Plumbing and Electrical Co., as heating, plumbing and electrical engineers at 45, Seaton Street, Hull.—Receiving order made 15th April on debtor's own petition.

R. A. Slocombe, electrician, residing and formerly carrying on business as an electrical contractor at 139, Penarth Road, Cardiff.—Public examination 19th June at the Law Courts, Cathays Park, Cardiff.

Liquidation

Lind & Co., Ltd., wholesale electrical suppliers.—Winding up voluntarily. Liquidator, Mr. S. O. Henry, Parkin S. Booth & Co., 5, Rumford Place, Liverpool, appointed 15th April.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 10th May:—

BURNDY. No. 755,900. Class 7. Machines and machine tools, all for use in the manufacture and installation of electrical apparatus and instruments; and motors (not for land vehicles), and parts.—Burndy Corporation, Norwalk, Conn., U.S.A. Address for service, c/o Woodham, Smith, Borradaile & Martin, 212, Strand, London, W.C.2.

MARATHON (design). No. 718,533. Class 9. Measuring instruments, magnets, welding electrodes, electric contacts, electric cables, insulated wire and fuse wire.—Deutsche Edelstahlwerke Akt.-Ges., Krefeld, Germany. Address for service, c/o Hyde & Heide, 2, Broad Street Chambers, Liverpool Street, London, E.C.2.

TAKCAL. No. 755,015. Class 9. Electric and electronic apparatus and instruments; and meters.—B. & H. Instrument Co., Inc., Fort Worth, Texas, U.S.A. Address for service, c/o Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.1.

ELCOTRON. No. 755,019. Class 9. Electrical apparatus for use in the supervision of industrial apparatus and machinery, for automatically controlling the operation of such apparatus and machinery and for giving audible or visual warning of failures in their operation.—E. Cohen and S. Roth, Paris, France. Address for service, c/o A. A. Thornton & Co., Napier House, 24-27, High Holborn, London, W.C.1.

SABA (design). No. 759,564. Class 9. Radio, television, telephonic sound recording, sound reproducing, scientific, nautical, surveying, navigating, radar, signalling and measuring apparatus and instruments; electrical and electronic apparatus and instruments; and parts and fittings.—Saba Schwarzwälder Apparate-Bau-Anstalt August Schwer Söhne G.m.b.H., Villingen, Schwarzwald, Germany. Address for service, c/o Mathys & Squire, 52, Chancery Lane, London, W.C.2.

PEMVOX. No. 760,068. Class 9. Sound amplifiers and telecommunication apparatus and parts.—S. T. Pemberton & Co., Ltd., 8, Church Street, Colmore Row, Birmingham, 3.

HERCULEES. No. 762,126. HERMEES. No. 762,127. Class 9. Electric arc welding electrodes.—English Electric Co., Ltd., 28, Kingsway, London, W.C.2.

LECTRA. No. 759,323. Class 11. Electric lamps and electric lamp bulbs; all for sale in the United Kingdom and for export to and sale in countries abroad other than Northern Rhodesia, Nyasaland, Kenya, Mauritius, St. Helena, British Somaliland, Tanganyika, Uganda or Zanzibar.—R. Singlehurst & Co., Ltd., Cotton Exchange Buildings, Old Hall Street, Liverpool, 3.

RADISIL. No. 761,226. Class 11. Electric heaters.—Engelhard Industries, Ltd., 52 High Holborn, London, W.C.1.

ROTOVAIR. No. 761,710. Class 11. Heating apparatus.—Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Tyseley, Birmingham, 11.

CATALOGUES AND LISTS

CONTACT LUBRICANT. — Pamphlet describing the properties of "Electrolube" lubricant for use on contacts in all types of switchgear and in radio, electronic and similar apparatus.—**Electrolube, Ltd.,** Oxford Avenue, Slough, Bucks.

CONTAINERS.—Broadsheet describing a range of collapsible light alloy goods containers designed for the safe and economical transit of electrical equipment, etc.—**Tracons, Ltd.,** Mowden Hall, Darlington.

ELECTRICAL EQUIPMENT.—372-page illustrated and priced catalogue covering domestic electrical appliances, wiring supplies and accessories, lamps, lighting fittings and tools.—**Brown Brothers, Ltd.,** Great Eastern Street, London, E.C.2.

ELECTRIC MOTORS.—Brochure (845) dealing with the Brook single-phase power pack for agricultural and industrial drives, consisting of a screen protected or totally enclosed fan-cooled motor provided with a hand operated or push-button starter.—**Brook Motors, Ltd.,** Empress Works, Huddersfield.

ELECTRIC TRUCK.—Leaflet describing the "Wrigley" E650 Mk III electric fork truck.—**Wessex Industries (Poole), Ltd.,** Dolphin Works, West Street, Poole, Dorset.

FANS.—24-page technical catalogue (3502) describing fans for mechanical draught.—**Sturtevant Engineering Co., Ltd.,** Southern House, Cannon Street, London, E.C.4.

HEATING EQUIPMENT. — Folder (G14031) illustrating a range of "Pyrobar" industrial electric heaters.—**British Thomson-Houston Co., Ltd.,** Rugby.

Illustrated brochure describing the "Universal 10" r.f. induction heater for brazing, hardening, soldering or annealing processes.—**Phœnix Telephone & Electric Works, Ltd.,** The Hyde, Hendon, London, N.W.9.

INSTRUMENTS.—Loose-leaf catalogue containing descriptive leaflets and technical bulletins on the company's range of electronic instruments.—**Airmec, Ltd.,** High Wycombe, Bucks.

STAFF LOCATION.—Brochure dealing with an audio frequency staff location system employing "fountain pen" receivers which are clipped in the pocket.—**Siemens Brothers & Co., Ltd.,** No. 3 Avon Trading Estate, Avonmore Road, London, W.14.

TAP CHANGERS.—Illustrated folder giving technical details and specifications of miniature automatic tap changing transformers.—**Claude Lyons, Ltd.,** Valley Works, Ware Road, Hoddesdon, Herts.

VOLTAGE STABILISER.—Leaflet dealing with the company's type 8571 a.c. automatic voltage stabiliser.—**Claude Lyons, Ltd.,** Valley Works, Ware Road, Hoddesdon, Herts.

WELDING EQUIPMENT.—Illustrated catalogue giving data on the "Rapid" range of spot welders.—**Sciaky Electric Welding Machines, Ltd.,** Falmouth Road, Slough, Bucks.

NEW PATENTS Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 8th May from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1951

884. Touvet, G.—Systems for establishing and maintaining communication between beam-emitting stations. 12th January, 1951. (774472.)

9839. Central Electricity Authority and Casson, W.—Signalling equipment combined with a.c. electric transmission lines. 28th July, 1952. (774507.)

1952

1185. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—System for transmitting telegraph signals. 29th December, 1952. (774509.)

8274. Allen West & Co., Ltd., Berry, A. W. J., and Hudson, C.—Electromagnetic switches adapted to be tripped under fault conditions. 20th March, 1953. (774071.)

8275. Allen West & Co., Ltd., Pavitt, F. J., and Berry, A. W. J.—Electromagnetic switches adapted to trip under fault conditions. 19th March, 1953. (774072.)

23804. Foster Transformers, Ltd., and Jennings, R. E.—A.c. difference determining circuits. 21st September, 1953. (774104.)

1953

1061. Hawke, W.—Sealing boxes for the joints of electric conductors. 14th December, 1953. (774172.)

1480. Standard Telephones & Cables, Ltd.—Electrical interference suppressors. 19th January, 1953. (774274.)

6511. Touvet, G.—Circuits for luminous discharge tubes. 12th January, 1951. (Divided out of 774471.) (774474.)

6512. Touvet, G.—Apparatus for generating optical radiation of high power. 12th January, 1951. (Divided out of 774471.) (774475.)

6836. Cutler-Hammer, Inc.—Electric circuit-breakers. 12th March, 1953. (774513.)

7170. Armour Research Foundation of Illinois Institute of Technology.—Discharge apparatus for reproducing electrical signals. 16th March, 1953. (774485.)

10918. General Electric Co.—Line followers. 21st April, 1953. (774517.)

13723. Ruston & Hornsby, Ltd.—Electronic instrument for measuring the amplitude of mechanical vibrations in terms of electrical voltages. 2nd June, 1954. (774376.)

13931. Associated Electrical Industries, Ltd.—Electrical computing apparatus. 28th April, 1954. (774108.)

16927. Accumulatoren-Fabrik Akt.-Ges.—Alkaline electric accumulators. 18th June, 1953. (774478.) 23455. Electric storage batteries. 25th August, 1953. (774479.)

21214. Kamm, L. J.—Electrical connector assemblies. 30th July, 1953. (774519.)

24005 and 24667. Strong Electric Corporation.—Arc lamps. 31st August and 7th September, 1953. (774383 and 774112.)

29617. Electric & Musical Industries, Ltd.—Automatic gain control circuits for television receivers. 15th October, 1954. (774113.)

33237. British Thomson-Houston Co., Ltd.—Electroluminescent cells. 30th November, 1953. (774092.)

33240. British Thomson-Houston Co., Ltd.—Electroluminescent devices. 30th November, 1953. (774093.)

33686. British Telecommunications Research, Ltd.—Transmission of television signals. 23rd November, 1954. (774114.)

35637. Electronic Instruments, Ltd., and Wilstead, G. H.—Devices comprising electrical condensers adapted to vary their capacity periodically. 20th December, 1954. (774116.)

1954

1844. Marconi's Wireless Telegraph Co., Ltd., and Buckingham, J.—Electronic switches. 11th January, 1955. (774117.)

2665. Marconi's Wireless Telegraph Co., Ltd.—Semi-conducting amplifiers. 21st December, 1954. (774388.)

3452. Communications Patents, Ltd.—Cathode-ray tube display systems or apparatus. 18th January, 1955. (774290.)

5303. Soc. Nouvelle de l'Outillage R.B.V. et de la Radio-Industrie.—Television circuits and the like. 23rd February, 1954. (774390.)

6229. British Telecommunications Research, Ltd.—Electrical communication systems and apparatus. 17th February, 1955. (774292.)

7317. Lines Bros., Ltd.—Radio control apparatus. 3rd March, 1955. (774120.)

11834. Philips Electrical Industries, Ltd.—Holding magnet having at least one permanent magnet and a load or workpiece mechanical detaching device. 23rd April, 1954. (774398.)

12599. English Electric Co., Ltd.—Servo control systems. 29th April, 1955. (774127.)

12792. Pole, J. C.—Electric light fittings. 3rd May, 1954. (774538.)

13013. Centre National de la Recherche Scientifique.—Machining methods and apparatus making use of intermittent electric discharges. 4th May, 1954. (774091.)

13216. Armour Research Foundation of Illinois Institute of Technology.—Apparatus, including an electron discharge device, for magnetically recording electrical signals. 16th March, 1953. (774486.)

13383. English Electric Co., Ltd.—Apparatus for the control of grid-controlled electric discharge devices. 6th May, 1955. (774400.)

13555. Pye, Ltd.—Magnetic scanning circuits for cathode-ray tubes and the like. 5th May, 1955. (774401.)

14375. Telephone Manufacturing Co., Ltd.—Electric contact making devices. 28th November, 1950. (Divided out of 728891.) (774539.)

14467. Edison Swan Electric Co., Ltd.—Means for locating electronic-discharge tubes in holders therefor. 17th May, 1955. (774190.)

14671. Stern, W. L.—Circuit arrangements for power factor regulating systems. 12th August, 1955. (774402.)

15079. Standard Telephones & Cables, Ltd.—Multi-beam television receiver. 21st May, 1954. (774300.)

16478. Edison Swan Electric Co., Ltd.—Electric switches operated by means of a pull-cord. 3rd June, 1955. (774193.)

18458. Principal Secretary of State for Foreign Affairs.—Electrical generators. 20th July, 1955. (774195.)

18696. Philco Corporation.—Screen structure of cathode-ray tubes for colour television receivers. 25th June, 1954. (Addition to 753551.) (774302.)

19655. Rotork Engineering Co., Ltd.—Torque-actuated devices for use with electric motors. 12th September, 1955. (774303.)

19956. Thorpe, Ltd., F. W., and Thorpe, F. W.—Fluorescent electric lighting installations. 6th July, 1955. (774198.)

19993. Ling, E. W. C.—Devices operable as either electric generators or transformers. 6th July, 1955. (774199.)

20005. Licentia Patent-Verwaltungs-Ges.—Contact rectifier with commutating reactors. 8th July, 1954. (774200.)

21058. Godden (Cheltenham), Ltd., M. H.—Electrical resistance mats. 11th July, 1955. (774306.)

21846. Electric & Musical Industries, Ltd.—Electric cables. 15th July, 1955. (774204.)

21862. Marconi's Wireless Telegraph Co., Ltd.—Cooling systems for gas-filled electron-discharge devices. 9th May, 1955. (774412.)

22924. Western Electric Co., Inc.—A.c. gate circuits. 6th August, 1954. (774308.)

23152. D.S. Plugs, Ltd.—Combined electrical switch and socket outlet. 4th August, 1955. (774208.)

25046. Electric & Musical Industries, Ltd.—Electromagnetic switches. 18th August, 1955. (774548.)

25617. Olympia Werke Akt.-Ges.—Photo-electric scanning arrangement. 3rd September, 1954. (774416.)

26972. Record Electrical Co., Ltd.—Voltage regulators. 15th September, 1955. (774134.)

27378. Collins, C. A. Henn-.—Water driven electrical generating plant. 26th October, 1955. (774551.)

28567. Philips Electrical Industries, Ltd.—Devices for producing electro-luminescence. 4th October, 1954. (774314.)

29256. General Electric Co., Ltd.—D.c. electric supply systems. 11th October, 1955. (Addition to 677247.) (774423.)

29285. Metal & Thermit Corporation.—Electrodeposition of copper. 11th October, 1954. (774424.)

30068. Alexander, J. M.—Electric hoist blocks. 19th October, 1955. (774140.)

31143. Rheostatic Co., Ltd.—Snap-action device. 28th October, 1954. (774219.)

32864. Gray & Son, Ltd., J. W.—Earthing of electrical conductors. 10th November, 1955. (774220.)

33459. General Electric Co.—Electrical terminal connectors. 18th November, 1954. (774553.)

33942. General Electric Co.—Cathode-ray apparatus for reproducing images from signals. 23rd November, 1954. (774555.)

34097. General Electric Co.—Surface electrical wiring devices. 24th November, 1954. (774143.)

35396. English Electric Co., Ltd.—Electric isolator switches. 6th December, 1955. (774145.)

35433. Metropolitan-Vickers Electrical Co., Ltd.—Steam turbine plants. 7th December, 1955. (774222.)

36853. Sulzer Freres Soc. Anon.—Steam turbine power plants with intermediate reheating between turbines. 21st December, 1954. (774225.)

37569. Collins Radio Co.—Visual display for a radiometric receiver. 29th December, 1954. (774148.)

1955

190. British Insulated Callender's Cables, Ltd.—Means for protecting overhead electric current supply wires for use with travelling collectors. 4th January, 1956. (774558.)

435. Thorn Electrical Industries, Ltd.—Illumination of dials and the like. 21st December, 1955. (774560.)

597. Ray-o-Vac Co.—Electric primary cells. 7th January, 1955. (774435.)

1922. General Electric Co.—Semi-conductor devices. 21st January, 1955. (774565.)

2588. Piles Wonder.—Electric battery with flat cells. 28th January, 1955. (774151.)

2887. Uhde Ges., F.—Arrangements for controlling switches or contacts for currents of high strength. 31st January, 1955. (774228.)

2898. Siemens-Schuckertwerke Akt.-Ges.—Electromagnetically operated switch devices. 31st January, 1955. (774229.)

4408. Telefunken Ges.—Electric motors. 15th February, 1955. (774232.)

4870. Bosch Ges., R.—Circuit-breakers for condensers fitted in housings. 18th February, 1955. (Addition to 773371.) (774154.)

[*Continued at foot of page* 845

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Anglesey.—County Education Committee. 3rd June. Electrical installation in College of Further Education, Pencraig, Llangefni. (See this issue.)

Australia.—State Electricity Commission, Brisbane. 8th May. Transformers ranging from 30 kVA to 600 kVA. (E.S.B. 9916/57. Ten/25440.)*

Southern Electricity Authority of Queensland, Brisbane. 19th June. 33 kV metal-clad switchgear with breaking capacity of 1,000 MVA and alternative tenders for switchgear with breaking capacity of 1,500 MVA. (E.S.B. 9917/57. Ten/25495.)*

Birmingham.—Corporation. 20th May. Four electric passenger lifts. (See this issue.)

3rd June. Electrical installations in 88 flats. (See this issue.)

Durham.—County Council. 8th May. Electrical installation in Hebburn Technical College. (See this issue.)

Formosa.—Central Trust of China, Taipei. 20th May. Electronic equipment, motors, generators and magnetic chuck. (E.S.B. 10561/57. Ten/25478.)* 21st May. Power fuses. (E.S.B. 10563/57.I.C.A. Ten/25477.)*

Frome.—U.D.C. 20th May. Two electrically driven pumps for Welwood pumping station. B. H. Parkes, waterworks engineer, Municipal Offices, North Parade.

Greece. — State Procurement Service, Athens. 11th May. Foundry machinery, including electric salt furnaces. (E.S.B. 9615/57. Ten/25445.)*

Ministry of National Defence, Athens. 16th May. X-ray diagnostic installation apparatus. (E.S.B. 9936/57. Ten/25456.)*

India. — Damodar Valley Corporation, Calcutta. 14th May. Electrical control equipment. (E.S.B. 9704/57. Ten/25411.)*

Stores Purchase Committee, Bangalore. 21st May. Two 33 kV circuit-breakers and three control panels. (E.S.B. 10439/57. Ten/25486.)*

Director General of Supplies and Disposals, New Delhi. 21st May. Shielded twin core cable. (E.S.B. 10003/57. Ten/25485.)*

Kirkburton (near Huddersfield).—Storthes Hall Group Hospital Management Committee. 8th May. Applications are invited for inclusion in the register of approved suppliers for road repairs, electrical re-wiring work and painting work. (See this issue.)

London.—Borough of Wandsworth. 22nd May. Supply of insulated cable. (See this issue.)

Middlesbrough.—Borough Council. 10th May. Electric lamps and unit dry cells for the period 1st July, 1957 to 30th June, 1958 (Form No. 43). Borough engineer, Municipal Buildings.

Newburn.—U.D.C. 29th May. Street lighting equipment. (See this issue.)

New Zealand.—G.P.O., Wellington. 28th May. Capacitors. (E.S.B. 9784/57. Ten/25487.)*

Northern Ireland.—Belfast Electricity Department. 30th May. Portable fire fighting appliances for Belfast West power station. (See this issue.)

Northern Ireland Housing Trust. 8th May. Electrical work in shops, flats, maisonnettes and offices at Rathcoole (Development 70), Whitehouse. Offices of the Trust, 12, Hope Street, Belfast.

Pakistan.—Posts and Telegraph Department, Karachi. 17th May. Air conditioning equipment. (E.S.B. 10322/57. Ten/25475.)*

Perthshire.—North of Scotland Hydro-Electric Board. Electrical services for Lednock dam. (See this issue.)

Peterborough.—City Council. 20th May. Electrical and automatic control equipment at Wilsthorpe waterworks. City and water engineer, Town Hall.

Philippines.—National Power Corporation, Manila. 2nd July. Hydraulic, electrical and switching equipment for Talomo No. 3 hydro-electric project. (E.S.B. 10087/57. Ten/25497.)*

Portuguese East Africa.—Government Purchasing Commission, Lourenço Marques. 10th May. One 30 kVA diesel generating set. (E.S.B. 10070/57. Ten/25435.)*

Rhodesia and Nyasaland. — Electricity Supply Commission, Salisbury. 27th June. 88 kV outdoor type circuit-breakers. (E.S.B. 9781/57. Ten/25496.)*

Sheffield.—Corporation. 10th May. Centrifugal pump complete with electric motor, control gear, etc., for Redmires Road sewage pumping station. H. Foster, town planning officer, Town Hall.

South Africa. — Transvaal Provincial Administration, Pretoria. 10th May. Two 50 kVA diesel driven generating sets and two 25 kVA transformers. (E.S.B. 10436/57. Ten/25493.)*

ORDERS PLACED

Durham.—County Education Committee. Electrical installation at Ushaw Moor Modern School (£6,900).—R. Robson, Willington.

Eston (Yorks).—U.D.C. Street lighting units at South Bank-on-Tees (£3,906).—B. L. Oliver.

Glasgow. — British Railways (Scottish Region). Electric lighting and power distribution work at St. Rollox works.—Johnson & Phillips.

Newcastle-on-Tyne. — Regional Hospital Board. Electrical installation at the new admission block at St. George's Hospital, Morpeth (£28,272).—Watson-Norie.

Plymouth.—City Council. Electric generator in connection with Stage 2 of the Lopwell (River Tavy) scheme (£1,531).—Crompton Parkinson.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Bromsgrove.—Houses (80), St. Kenelm's Road estate; clerk to R.D.C., Council Offices, Birmingham Road.

Cardiff.—Block of 90 flats at Coryton, Whitchurch (£200,000); S. P. Youldon, R.D.C. surveyor, 20, Park Place.

Chatham.—Shops and offices, High Street; Multiple Business Centre Holdings, Ltd., 38, Upper Brook Street, London, W.1.

Chelmsford.—Central garage (£52,000) and ambulance station (£19,000), Coval Lane; H. Conolly, Essex county architect, County Hall, Chelmsford.

Cheltenham.—Offices, Promenade; L. W. Barnard & Partners, architects, 13, Imperial Square.

Chesterfield.—School, Storrs Road; borough architect.

Coventry.—Occupation centre for mentally handicapped children, Torrington Avenue; A. G. Ling, city architect.

Hotel, Stoney Stanton Road; W. S. Hattrell & Partners, architects, 1, Queen's Road, Coventry.

Wing to art gallery and museum; Albert Herbert & Son, architects, 18, Friar Lane, Leicester.

Dudley.—Grammar school extension; Alan R. Young, architect, 4, Parson Street.

Edgware.—Showrooms and offices, High Street; E. H. Jones, Ltd., 15, Colindale Avenue, London, N.W.9.

[*Continued on next page*

NEW PATENTS (*continued*)

5256. Williams, W. J.—Variable control for speed actuated and other electric switches. 22nd February, 1955. (774438.)

7050. Neufville, J. M. M., and Trottier, J. E.—Electric current generators. 10th March, 1955. (774234.)

7844. Collins Radio Co.—Noise limiting circuits for radio receivers. 17th March, 1955. (774440.)

9048. Radio Corporation of America.—Synchronous detectors. 28th March, 1955. (774441.)

9851. Li, Y. T., and Lee, S. Y.—Transducers. 4th April, 1955. (774328.)

10567. Compagnie Générale de Télégraphie sans Fil.—Travelling-wave tubes. 12th April, 1955. (774240.)

10801. British Thomson-Houston Co., Ltd.—Operation of dynamo-electric machines in mutual synchronism. 14th April, 1955. (774331.)

15397. Machlett Laboratories, Inc.—Electron tubes of the gas filled type. 27th May, 1955. (774452.)

15401. General Electric Co.—Dynamo-electric machines. 27th May, 1955. (774453.)

15430. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Control of electric heaters. 27th May, 1955. (774337.)

19159. General Electric Co.—Control device for refrigeration apparatus. 1st July, 1955. (774349.)

20697. Fairchild Camera & Instrument Corporation.—Luminous output transducer. 18th July, 1955. (774163.)

22407. Westinghouse Electric International Co.—Electrical connector devices. 4th August, 1955. (774165.)

22830. Terney, E. W.—Electric cigarette lighters. 8th August, 1955. (774259.)

22889. Hoover, Ltd.—Suction cleaners. 9th August, 1955. (774354.)

23837. Philips Electrical Industries, Ltd.—Magnetic devices and circuits therefor. 18th August, 1955. (774166.)

29342. Standard Telephones & Cables, Ltd.—Method of producing ferrites. 14th October, 1955. (774358.)

30827. Sylvania Electric Products, Inc.—Device for handling the grids of electric discharge tubes. 27th October, 1955. (774361.)

31710. Touvet, G.—Means for igniting an electric-discharge tube fed from a source of radio-frequency excitation. 12th January, 1951. (Divided out of 774471.) (774477.)

34573. General Electric Co.—Electric cooking appliances. 2nd December, 1955. (774368.)

35442. General Electric Co.—Circuit arrangement for capacitor motors. 9th December, 1955. (774369.)

1956

6028. Plessey Co., Ltd.—Mass production and packaging of small electrical components. 28th July, 1953. (Divided out of 774073.) (774074.)

Eston.—Houses (241), Teesville East estate; N. C. Harrison, U.D.C. surveyor, Normanby Road, South Bank-on-Tees.

Felling (Co. Durham).—Houses (154) and flats (12), Leam Lane estate; John Clark & Son, Ltd., builders, New Seaham, Co. Durham.

Frampton-on-Severn. — Houses (67); Dancey & Meredith, architects, Bleak House, Station Road, Gloucester.

Frimley.—Rebuilding Burrow Hill Boarding School (£145,633); L.C.C. Architects' Department, County Hall, Westminster Bridge, London, S.E.1.

Leicester.—Second instalment of Anstey Lane Secondary School (£174,240), completion of Wyggeston Boys' School (£140,000), new Goldhill Secondary Modern School for City Council (£148,324), gymnasium block at Wycliffe Secondary School (£25,000) and clinic at New Parks (£17,000); city architect.

Liverpool.—Shop development, Kirkby estate; Ravenseft Properties, Ltd., 52, Charles Street, London, W.1.

London.—Office block, Mark Lane; City of London Real Property Co., Ltd., 16, Mark Lane.

Synagogue, Smith Terrace, Chelsea; Cyril Adler, architect, 55, Pall Mall, S.W.1.

Office block, Melton Street, St. Pancras; Transport Salaried Staffs Association, 25, Euston Road, N.W.1.

Extensions to offices, Blackfriars Road, Southwark; Wood & Weir, surveyors, 5, Wigmore Street, W.1.

Five-storey block of flats, St. Luke's Road, Paddington; Andrew Roberts & Partners, architects, 17, Cromwell Place, S.W.7.

Four-storey extension to Elmfield County Secondary School for Girls (£265,720), Battersea; L.C.C. Architects' Department, County Hall, Westminster Bridge, London, S.E.1.

Maidstone.—Extensions to printing works and paper store; Kent Messenger, Ltd., Week Street.

Newport (Mon).—Factory extension for H. Lotery & Co., Ltd., East Usk Road; W. T. Nicholls, Ltd., builders, St. Paul's Road, Gloucester.

Northumberland.—Additions to Alnwick Dule's County School (£28,000 first stage); county architect, County Hall, Newcastle-on-Tyne.

Plymouth.—Community centre, including shops, church, licensed premises, etc., at St. Budeaux, for the Admiralty; Civil Engineer-in-Chief, Chamberlain Way, Pinner, Middx.

Works extensions; Tecalemit, Ltd., Forder Valley Road.

Austin Farm Primary School; city architect.

Portsmouth.—Extensions and alterations at Technical High School (£215,000); John Hunt, Ltd., builders, Cleveland Road, Gosport.

Reading.—Dwellings (175), Coley Park estate; R. E. Unsworth, surveyor, 25, Queen Victoria Street.

Redcar.—Houses (32), Staintondale Avenue; Premier Dwellings, Ltd., builders, Albert Road, Middlesbrough.

Rochester.—Flats (228), Riverside estate; city surveyor, 66, Maidstone Road.

Rotherham.—Extensions to Technical College; A. E. Mohring & Son, electrical consultants, 32, Queen Victoria Street, London, E.C.4.

Sandwich.—Two-storey laboratory and offices; Pfizer, Ltd., pharmaceutical manufacturers, Sandgate Road, Folkestone.

Sheffield.—First phase of extensions to College of Art, Brincliffe (£147,931); Henry Boot & Sons, Ltd., public works contractors, Banner Cross Hall, Eccleshall Road South, Sheffield, 11.

Southampton.—Kitchen (£78,597) and stores (£42,089) at Coldeast Hospital, Locks Heath; architect to the South West Metropolitan Regional Hospital Board, 76, Wimpole Street, London, W.1.

South Shields.—Bungalows (102), Whiteleas estate; John Reid, borough engineer.

Surbiton.—Houses (109), Middleton estate; Clifford E. Culpin, architect, 39, Doughty Street, London, W.C.1.

Swansea.—Omnibus garage, William Street; H. A. Penney, architect, 26, St. Augustine's Parade, Bristol, 1.

Factory, New Cut Road; Swansea Contractors, Ltd., 14-18, High Holborn, London, W.C.1.

Tipton.—Works extensions; P. H. Muntz & Co., Ltd., Great Bridge Street.

Wakefield.—R.C. church, hall and presbytery, Hendal Lane; G. Doyle, architect, Cabinet Chambers, Basinghall Street, Leeds.

Washington (Co. Durham).—Old people's houses (30), Coach Road; U.D.C. surveyor.

Watford.—Multi-storey block of flats, Central Car Park site; F. C. Sage, borough surveyor, Town Hall.

West Bromwich.—Houses (209), Witton Lane; H. Schofield, borough engineer, Town Hall.

Weymouth.—Science laboratory, and extensions to dining hall, Weymouth Grammar School; county architect, County Hall, Dorchester.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 6th May

BIRMINGHAM.—James Watt Institute, 6 p.m. I.E.E. South Midland Centre. Discussion on "The Influence of Maintenance Requirements on the Design of Industrial Electrical Equipment," opened by A. C. Fox and J. H. Harris.

BRIGHTON.—S.E.E.B. Offices, Castle Square, 5.30 p.m. E.I.B.A. Sussex Centre. Annual general meeting.

ILFORD.—Angel Hotel, 7.30 p.m. A.S.E.E. North-East London Branch. "Electricity in the Paint Industry," by M. D. Blackley.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Synchronous Electric Clocks."

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "The Co-ordination of Education and Practical Training in Sandwich Courses," opened by C. Grad and A. Draper.

SHEFFIELD.—Royal Victoria Station Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "Visual Call Systems."

STOKE-ON-TRENT.—North Stafford Hotel. I.E.E. North Staffordshire Sub-Centre. Annual general meeting followed by "Electricity in Modern Commercial Horticulture," by C. A. Cameron Brown and A. W. Gray.

Monday, 6th May, to Friday, 17th May

BIRMINGHAM.—Castle Bromwich. British Industries Fair.

Tuesday, 7th May

EDINBURGH.—Incorporated Plant Engineers, Edinburgh Branch. Visit to a coal-mine in the Lothians area.

LEEDS.—C.E.A. Offices, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. Annual general meeting.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. "Invention and Nature," by F. W. Meredith.

Savoy Hotel, W.C.2, 12.30 for 1 p.m. British Electrical Development Association. Annual luncheon, followed by the annual general meeting.

Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2, 7 p.m. Incorporated Plant Engineers, London Branch. "Contemporary Plant Engineering in the U.S.A.," by H. M. Sylvester.

MANCHESTER.—Engineers' Club, 6.15 p.m. I.E.E. North Western Centre. Annual general meeting, followed by "Lighting for the Amateur Stage," by F. Day.

NEWCASTLE-UPON-TYNE. — Crown Hotel, 7.30 p.m. A.S.E.E. Tyneside Branch. "The 'Nightstor' Story," by E. H. Parker.

Tuesday, 7th May, to Friday, 17th May

LONDON.—Olympia. Instruments, Electronics and Automation Exhibition.

Wednesday, 8th May

ABERDEEN.—Robert Gordon's Technical College, 7.30 p.m. I.E.E. North Scotland Sub-Centre. Annual general meeting, followed by "Visit to Russia," by J. S. Pickles and R. J. Rennie.

BIRMINGHAM. — James Watt Institute, 6.30 p.m. I.E.E. South Midland Graduate and Student Section. Annual general meeting.

Birmingham Exchange & Engineering Centre, Stephenson Place, 7.15 p.m. A.S.E.E. Birmingham Branch. Film show.

CHARLTON.—I.E.E. London Graduate and Student Section. Visit to Johnson & Phillips, Ltd., at 2 p.m.

HALIFAX.—Crown Hotel, Horton Street, 7.30 p.m. A.S.E.E. Halifax Branch. "Developments in Fluorescent Lighting," by J. W. Bessant.

LONDON.—White Hall Hotel, Bloomsbury Square, W.C.1, 7.30 p.m. A.S.E.E. Central London Branch. Film show.

Hope House, 45, Great Peter Street, Westminster, S.W.1, 7 p.m. Women's Engineering Society, London Branch. "Prospects for Nuclear Power," by Dr. J. V. Dunworth.

Festival Hall, South Bank, 9.30 a.m. B.E.A.M.A. Educational Conference.

Thursday, 9th May

HULL.—Y.E.B. Offices, Ferensway, 6.20 p.m. Lecture on "Developments in Railway Electric Traction," by J. A. Broughall.

LIVERPOOL.—Exchange Hotel, 7.15 p.m. Incorporated Plant Engineers, Merseyside and N. Wales Branch. "Nuclear Reactors for Power Generation," by J. A. Dixon.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation Section. "The World's Copper Resources," by H. I. Miller.

John Adam Street, W.C.2, 5.15 p.m. Royal Society of Arts. "The St. Lawrence River Power Project," by Otto Holden.

RYDE (I.O.W.)—Ryde Castle Hotel, The Esplanade, 6.30 p.m. I.E.E. Southern Centre. "Colour Television," by C. J. Stubbington.

Friday, 10th May

BRISTOL.—Grand Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. "Presentation Lighting," by C. R. Passmore.

LONDON.—Connaught Rooms, Great Queen Street, W.C.1, 7 for 7.30 p.m. Radar Association. Annual dinner.

Feathers Hotel, S.W.1, 6.30 p.m. Electrical Trades' Commercial Travellers' Association. General meeting.

STOKE.—Grand Hotel, Hanley, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Earth Loop Testing," by E. H. Lea.

Friday, 10th May, to Sunday, 12th May

BLACKPOOL.—Association of Supervising Electrical Engineers. Annual conference.

Saturday, 11th May

LEEDS.—1, Whitehall Road, 1, 2.30 p.m. I.E.E. North Midland Graduate and Student Section. Annual general meeting.